FEBRUARY 1956 Vol. 18 No. 2

MINING WORLD

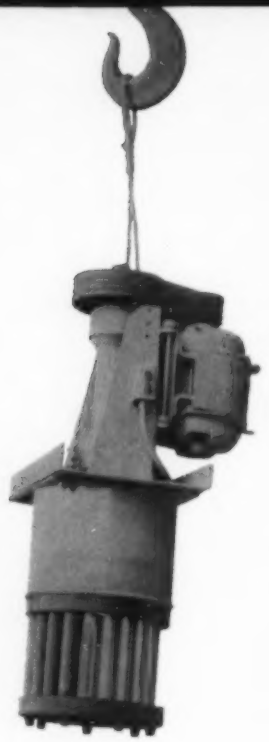
Underground Plans at Montana Phosphate

Recovering Gold from Congo Deposits

More Profit in U_3O_8 By Stripping?

Page 48

50 cents a copy—3s 6d in sterling



ONE DEAD CELL

but this WEMCO Fagergren still produces

There is no down time when a Wemco Fagergren mechanism is lifted out for service. The bank of cells continues to produce without interruption. Sanding up of the inactive cell is no problem. When the serviced unit (or a spare) is returned, it simply digs its way back into position.

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WESTERN MACHINERY COMPANY

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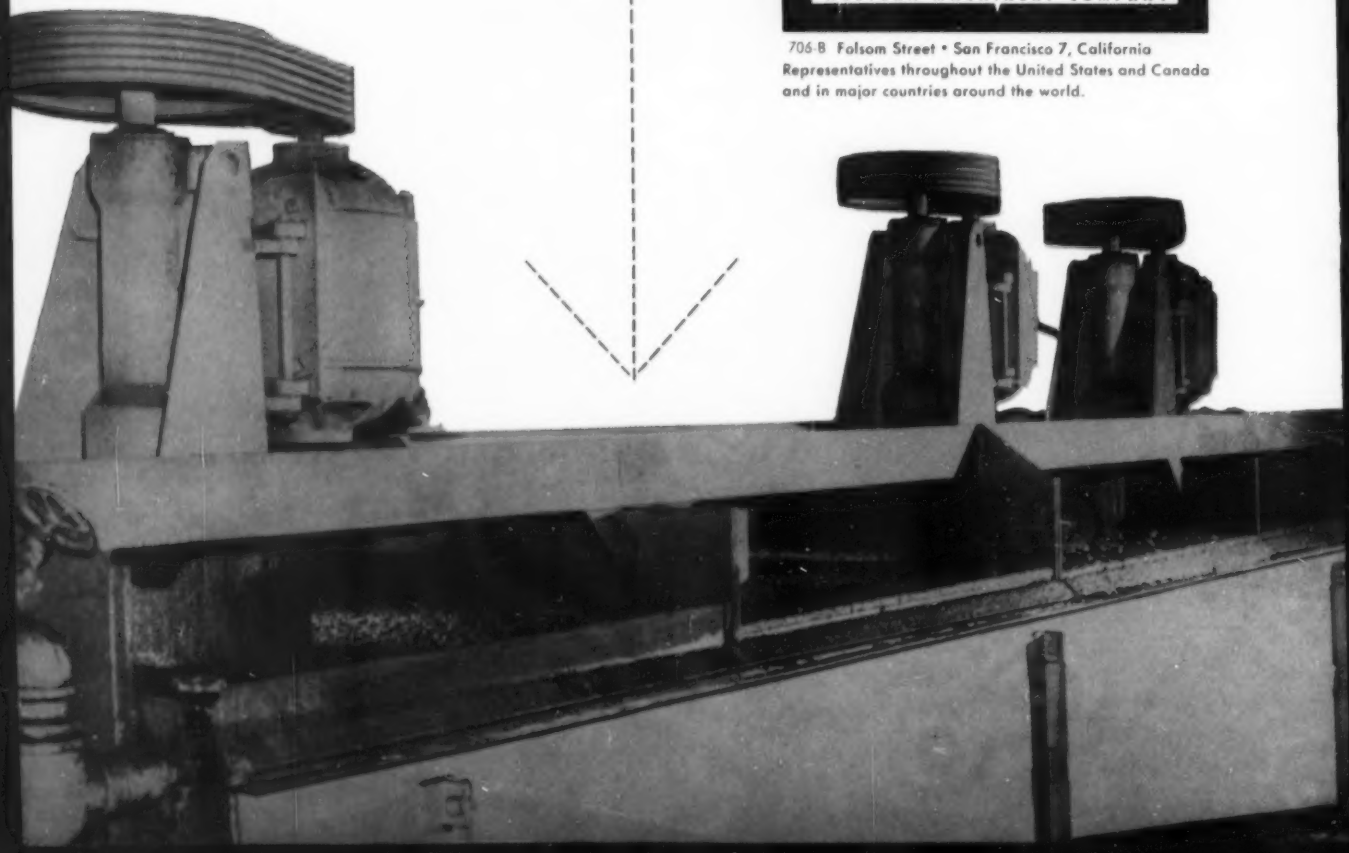
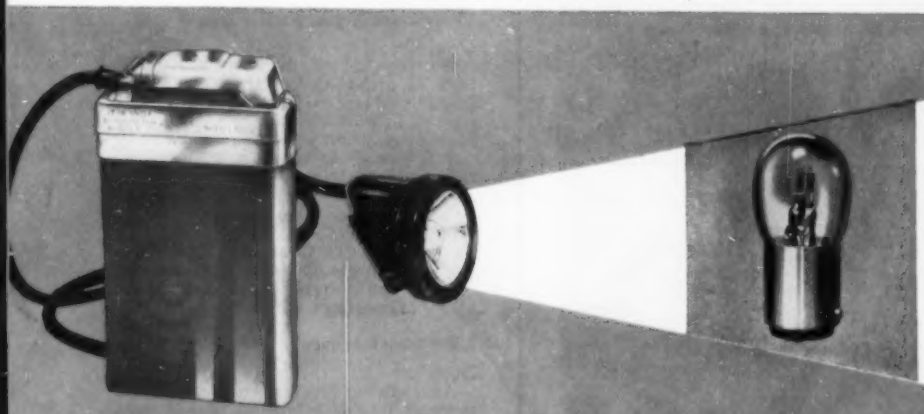
Representatives throughout the United States and Canada and in major countries around the world.

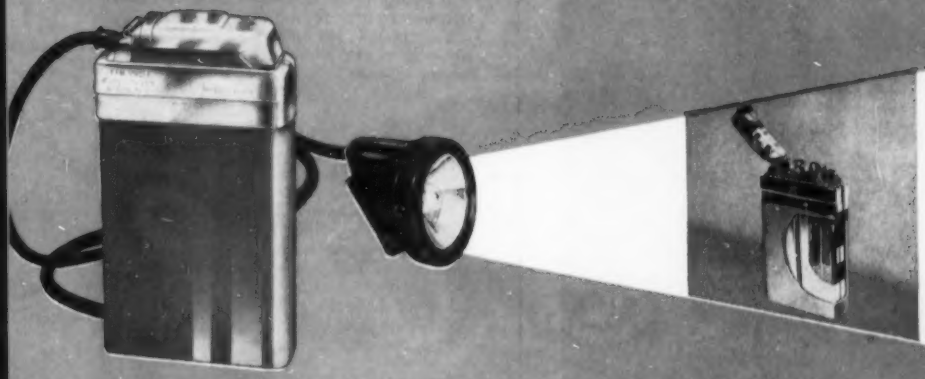


You can depend on the EDISON R-4's brilliant, unfailing light...



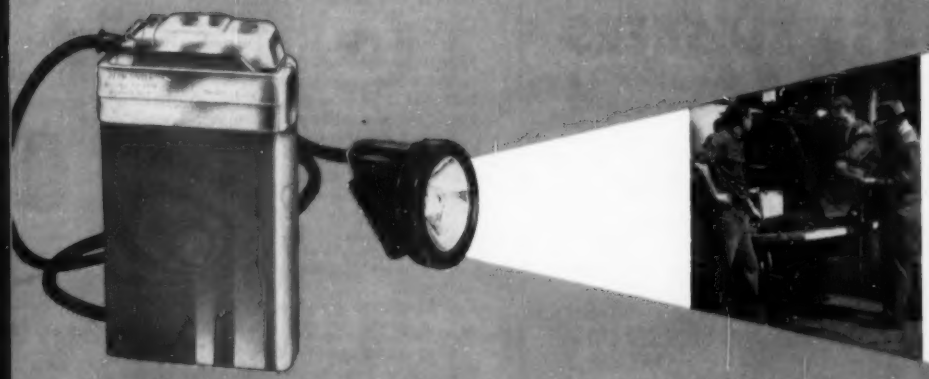
The Bulb's reserve filament means continued, full light

See the double filament in the bulb? It's your proved protection against lost time for the miner, and a short crew for the foreman. If one filament burns out, a turn of the switch restores continued, brilliant, full illumination—*working light*, not just emergency light!



The battery that doesn't fail on the job

Because light is only as dependable as the battery that provides the power, battery service life is the only answer to performance. The Edison R-4 Battery does not destroy itself to function, does not deteriorate when not in use. You get the most dependable light, shift-after-shift, for years.



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CLIMAX ADDS SEVEN MORE DTP-150 SLUSHERS

Another repeat order of these big Vulcan Tandem Slushers brings to more than 90 the total of large Vulcan Slushers ordered for use at Climax Molybdenum Co. since 1934. This order includes frame adapters to fit bases built for similar hoists which were bought earlier.

Here, as in other places, Vulcan continues to offer outstanding mechanical quality as well as provision of prompt and effective factory service.

For any slusher requirement, 10 H.P. to 150 H.P., there is a Vulcan model ready to work for you—a lifetime at hard labor.

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GRAB SAMPLES From the Mail

Concessions Not Expired

Dear Sir:

On page 84 of the December 1955 issue of MINING WORLD, mention is being made of nickel concessions in Indonesia ". . . formerly held by Oost-Borneo Maatschappy and now expired."

Will you please note that said concessions were granted in 1939 for a period of 40 years and we have at this moment no knowledge of these concessions being expired or cancelled.

J. O. VAN GRUISEN
Managing Director
Oost-Borneo Maatschappy N. V.
Granehage, The Netherlands

Likes Uranium News

Dear Sir:

As a mining investor I can often find news of mining companies that I own stock in printed in MINING WORLD. Especially in your mining news of different states.

I would be glad to see more articles written on small mines, especially in Idaho and Washington. Also like your latest news and views on uranium. Need more pages on that in your magazine.

GUS D. BRAY
Miami, Florida

Best Publication That I Know

Dear Sir:

I have just received my first copy of WORLD MINING which reached me today. It is the best publication that I know for coverage of the whole world of mining and metal production.

I shall look forward to your further issues with the certainty that they will always be interesting.

D. W. HOPKINS
Metallurgical Department
Technical College
Mount Pleasant
Swansea, Wales

Covers the Mineral World

Dear Sir:

I often find your journal, WORLD MINING, with some of my fellow geologists and read it with keen interest. I find that it gives a good lot of information about the activities of the mineral world.

I shall be thankful to you if you can kindly supply me copies of this useful journal for my use.

Yours faithfully,
C. SURYANARAYANA RAO
Geologist, Department of Atomic Energy
Bombay, India

Top Magazine For Desert Rat

Dear Sir:

Your issues are excellent and I do enjoy them. You have a top magazine in the MINING WORLD. When I read the publication the next place it goes is to Nevada. I have an old Desert Rat friend there. He enjoys the magazine much as I do. After he is finished, he passes it on to his old prospecting friends.

As you see, it certainly makes the rounds.

DUKE THOMAS
Herkeimer, New York

Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 18 **FEBRUARY 1956** No. 2

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COVER: A panorama of several pictures shows how Continental Uranium has departed from traditional practice to recover uranium ore. The earth moving equipment will haul away 2,500,000 yards of overburden, at a stripping ratio of 30 to 1, after which 75,000 tons of ore will be mined by selective open pitting.

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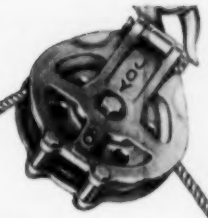

JOY quick opening SHEAVE BLOCKS

with the Locking Pin that can't be lost!

Only Joy Sheave Blocks have the exclusive non-removable locking pin that—

1 Can't possibly loosen and fall out when locked in place

2 Loosens by non-removable key when sheave must be opened.

3 Hangs by a flanged end of locking key, never is removed completely from the sheave to be lost in the muck pile.

OTHER FEATURES—

- Sealed-for life bearings—keep lubricant in, dirt and water out.
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Write for FREE Bulletin 46-8

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Pittsburgh 22, Pa.

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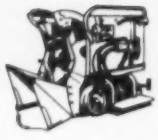
MARIONS IN COPPER

This is one of more than 40 Marion machines at work for one owner in one of the biggest producing copper mines of the world. It is a 7 yard Marion 151-M, designed for continuous service in the world's heaviest digging.

MARION POWER SHOVEL CO. • MARION, OHIO



12B LOADER

21 LOADER

40H LOADER

THINKING OF REOPENING AN OLD PROPERTY?

Several good mining properties, unoperable only a few years ago, have taken on a new look with present day metal prices.

The cost of setting up to do business has many a mining man weighing the cost against the advantages.

New equipment available today offer many advantages for this work. The Eimco 630 crawler loader for trackless mining provides the ultimate in dependable loading equipment where it is not economical to relay track.

Investigate this sturdy loader — weight approx. 10,000 pounds — 3 tons per minute — operating and maintenance costs less than 1c per ton loaded.

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Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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EIMCO

B-190

LIMA

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are geared to mining conditions

Down time in digging operations is costly—not only because of difficult on-the-job maintenance—but because down time of machines ties up costly labor and idles other expensive equipment. Lima shovels and draglines, with "built-in" stamina for the tough jobs, pay big dividends by assuring continuous operation with maximum output at lowest cost.

Painstaking care in every step of manufacture assures the quality of every part, long trouble-free service of every Lima machine. You'll be able to put a Lima to work and keep it working day in and day out with only routine maintenance.

Get complete details from your nearby LIMA distributor . . . or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

COMPARE QUALITY! No other machine gives you as much as LIMA!

1. Sturdy unit-type construction.
2. Simple, rugged design.
3. Low center of gravity.
4. Long wide crawlers for greater stability.
5. Permanent shaft alignment.
6. Smooth running anti-friction bearings.
7. Ample power for big output.
8. Big capacity drums and sheaves are easy on cable.
9. Air-operated clutches on most models.
10. Large braking areas.

These are only a few of the features which help you *strip more, dig more* and *load more* with a LIMA. There's a type and size for every job—shovels to 6 yds., cranes to 110 tons and draglines variable. Smaller capacities on rubber.

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LIMA SHOVELS · CRANES · DRAGLINES · PULLSHOVELS

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Construction Equipment Division · LIMA · OHIO · U. S. A.

"Eucs" pace production at Nelson Crushed Stone Ltd.

Powered by a 300 h.p. engine with 10-speed transmission, the Model 31 TD Rear-Dump "Euc" has a top travel speed of 32 m.p.h. with full payload . . . one of the reasons "Eucs" haul more tonnage at lower cost.

The limestone quarry and plant of Nelson Crushed Stone Ltd., north of Hamilton, Ontario, is one of Canada's newest and most modern operations. This stone plant, with a capacity of more than 500 tons per hour, was designed for maximum efficiency and flexibility—it can produce virtually any size stone.

Three 22-ton Rear-Dump "Eucs", loaded by a 2½ yd. shovel, haul dolomite to a primary crusher about ¼ mile from the face. Equipped with quarry bodies having flared sides that facilitate loading and minimize spillage, these "Eucs" have 300 h.p. engines and 10 speed transmissions.

Rear-Dump Euclids are standard off-the-highway hauling units in mines and quarries because of their ability to stay on the job year after year with low maintenance cost. For a production and cost estimate on your operation get in touch with your Euclid dealer . . . there's no cost or obligation.

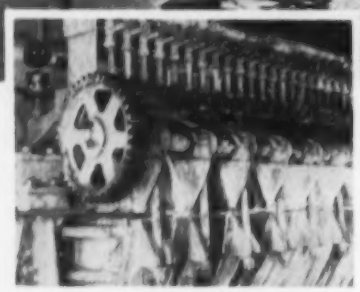
Rugged construction of the body and frame enables "Eucs" to withstand the impact of loading rock and other heavy excavation with large loading equipment. Here a 2½ yd. shovel loads 22 tons of dolomite for haul to the primary crusher.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

General view of plant with three Dorr Thickeners in foreground.



Closeup of one of the six Sweetland Filters.

Dorr-Oliver Techniques

at INTERMOUNTAIN CHEMICAL COMPANY

(OPERATED BY WESTVACO CHLOR-ALKALI DIVISION, FOOD MACHINERY & CHEMICAL CORPORATION)

The vast trona deposits throughout the Green River, Wyoming, area represent an assured supply of soda ash for expanding western industry. But before calcination, insolubles amounting to approximately 10% must be removed by physical means. And here Dorr-Oliver equipment and methods play a vital role.

At Intermountain Chemical Company's Green River Processing Plant, trona ore is crushed, screened and dissolved in mother liquor and a small amount of makeup water. Solution is then clarified in two 80′ dia. Dorr Thickeners. Underflows are washed free of entrained salt in a third Dorr Thickener. Combined overflow from the three Thickeners is a sodium sesqui-carbonate solution which is polished on six #12 Sweetland Filters. The Sweetlands are of cast iron construction with 72 leaves each providing a total filter area of 6024 square feet. After polishing, the solution is concentrated in triple effect vacuum crystallizers. The resulting crystals are thickened in two 30′ dia. Dorr Units and are then calcined to soda ash. Operated by Westvaco Chlor-Alkali Division of Food Machinery and Chemical Corporation, the plant has a capacity of 350,000 tons per year.

For the Process Industries, Dorr-Oliver offers a complete and integrated service. Well-designed equipment, as installed at Intermountain Chemical, is an important part of this service. But if your processing needs involve laboratory and pilot plant testing, flowsheet preparation, economic analysis or complete plant design and construction, we can also be of help. For a complete picture of the scope of the Dorr-Oliver technical service write for a copy of Bulletin No. 7003. Dorr-Oliver Inc., Stamford, Connecticut.

Sweetland — T.M. Reg. U. S. Patent Office

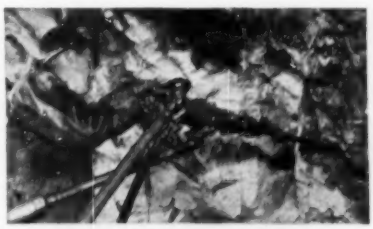
Gardner-Denver . . . Serving the World's Basic Industries

Gardner-Denver 125-foot portable at entrance to Utah uranium mine. Supplies air for drilling within the mine.

"Cash in" quicker on uranium with Gardner-Denver quality equipment

Whether you're in the exploration, development or production stage, Gardner-Denver rock drills, air compressors and other mining equipment can help you get the work done faster. Quality products, engineered by Gardner-Denver and proved in mining enterprises all over the world, assure the dogged dependability you need in out-of-the-way locations. Low operating and maintenance costs can stretch your "stake" further—increase your profits.

Send for bulletins on Gardner-Denver portable or skid-mounted compressors, drilling equipment for deep test holes, sinkers, drifters, stopers, air hoists, mine car loaders.



S-48 sinker and air feed leg — a lightweight, fast-drilling combination.

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THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

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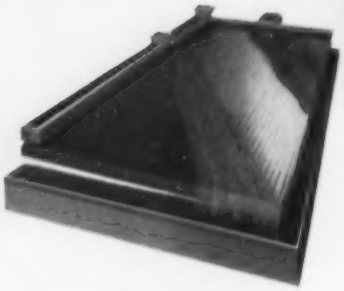
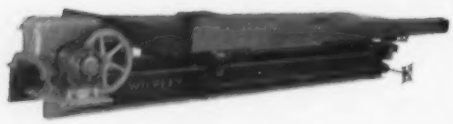
WILFLEY CONCENTRATING TABLE

many profitable applications in modern metallurgy

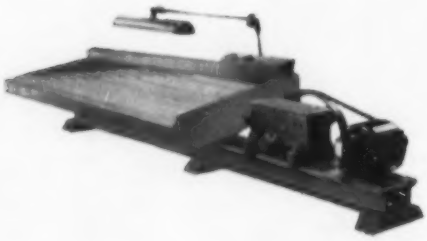




No. 6 Wilfley Table with variable speed V-Belt motor drive.

No. 11-D Wilfley Table showing concrete foundations.

No. 12 Wilfley Table with variable speed V-Belt motor drive.



No. 13 Spec. Wilfley Table with overhead Lamp, as Flotation Pilot Table.

The **genuine WILFLEY TABLE,** as manufactured by Mine & Smelter, has been an important factor in the success of many metallurgical processes for years. There are still many applications where the Wilfley Table is of particular value and cannot be equalled for economical and efficient performance. Some of these are . . .

- **Before or after flotation for recovery of mineral not readily recovered by flotation.**
- **As pilot tables following flotation to indicate efficiency of flotation.**
- **To concentrate low grade mineral producing a high grade concentrate for further treatment.**
- **To wash and clean inferior coals, iron ore, etc.**
- **In metal and reclamation plants.**
- **For two or more mineral separations from flotation concentrates, previous table concentration or from original table feed.**

The Wilfley Table has an easily adjustable stroke from 5/8" to 1", a speed range from 240 to 300 strokes per minute, an adjustable table inclination from zero to 1" per foot, and a selection of wood riffles of various depth and taper . . . all of which permit a flexibility to best meet the conditions of each application.

WRITE FOR CATALOG

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Representatives in Foreign Countries

How you can save money and men on Mine exploration

The HIGH-SPEED, self-loading D Tournapull has the versatility needed to speed all the exploratory phases of your mine development. This job-proved unit moves in or around any location at speeds up to 28 mph. It cuts grades accurately, hauls anywhere, and spreads in controlled layers. Its big tires effectively compact material. Where land restoration is required, the "D" is ideal for segregating topsoil, refilling and landscaping. Where ore-bearing soils are to be tested, the 138 hp "D" will self-load over 5 bank yards per trip for quick delivery to screens or hopper. Where dams or reservoirs are needed for water supply — ditches or sluiceways for drainage — the "D" moves in, gets the job done fast, and moves on to the next task without delay.

Big low-pressure tires, positive power steer and a unique power-transfer differential enable Tournapulls to travel slippery saddleback roads or through deep mud and sand which would stall an ordinary truck. Electric scraper and steer controls and a foam-rubber seat give easy operation and easy riding in tough going. These are but a few of the reasons why this fast utility tool speeds search and pilot tasks, cuts costs, and eliminates many inconveniences of exploratory operation. It will pay you to learn more about what it can do for you.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-58-M-b w

The self-loading "D" handles all these jobs:

- Clears, levels sites for camps and drill setups. Eliminates cost of expensive cribbing.
- Strips surface material to expose bedrock. Gives you better access to formation.
- Builds, maintains and gravels access roads. Fills roads across soft, low areas.
- Loads, hauls material from open pits in 9-ton (7-yard) scraper.
- Hauls in supplies. Carries loads over terrain no other wheeled vehicle can cross.
- Levels building sites. Digs sludge basins, drainage ditches and sluiceways.
- Moves into any site under its own power — over pavement or cross-country.
- Supplies electricity for emergency lighting or temporary equipment operation.
- Plows snow from supply roads. Self-loads, hauls snow, ice from camp sites.
- Dozer blade available. One man can do clearing, build roads, drain, grade and strip.

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

Hard, Rough, Tough Jobs Need Eimco Dependability

This case study concerns one Eimco 105 loader on which an open pit mine depends for its entire production.

Location — in an isolated and remote area of Southwest Africa.

Conditions — dusty, dry and hot. Pit floor uneven-solid rock.
Mining — selective
Operators — native
Maintenance — Nil

Report — The Eimco 105 Tractor Excavator has operated some 3200 hours on consecutive two shift basis under the most difficult conditions. Native operators are unnecessarily abusive of the equipment. The ore is exceptionally abrasive and heavy. No other loading equipment is available so the Eimco must stay on the job. One operator ran the 105 a complete shift without fan belts, both of them run the machine to the solid rock wall and spin the tracks when cleaning out an ore pocket.

Eimco does not recommend abuse on their tractor-excavators or any other equipment but Eimco produces a machine that can stay on the job day in and day out—month in and month out—when you are depending on it and when plant capacity depends on a single production loading unit.

There are many reasons for Eimco superiority on the tough jobs. The design of an Eimco is simple-strong. The material of construction is all alloy steel. The operating features make it the easiest tractor to operate and the most maneuverable. When you need guts in a tractor, compare an Eimco with anything you are using or have used previously.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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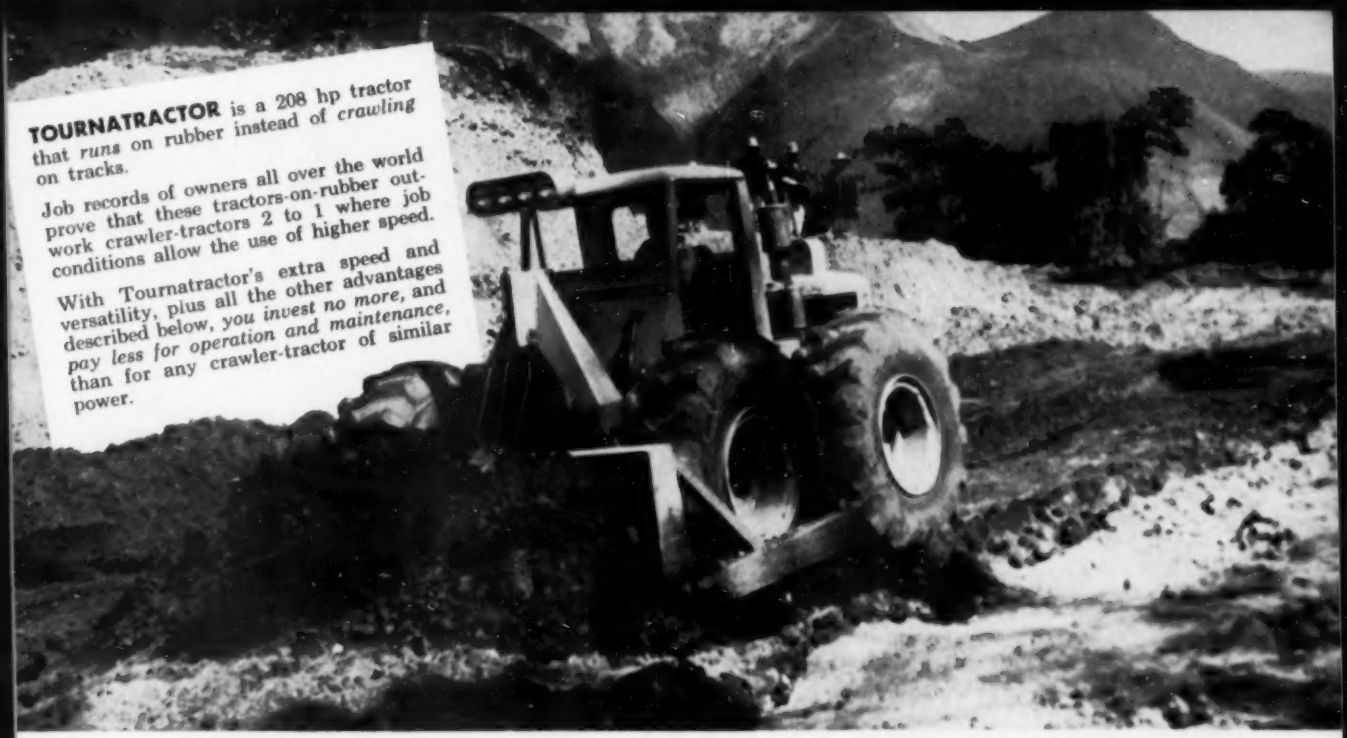
B-172


TOURNATRACTOR is a 208 hp tractor that *runs* on rubber instead of *crawling* on tracks.
Job records of owners all over the world prove that these tractors-on-rubber outwork crawler-tractors 2 to 1 where job conditions allow the use of higher speed.
With Tournatractor's extra speed and versatility, plus all the other advantages described below, you *invest no more*, and *pay less for operation and maintenance*, than for any crawler-tractor of similar power.

Does speed fit your job?

Check these tractor advantages

19 mph forward . . . 8 in reverse

Tournatractor pulls, dozes, pushes at working speeds 2 to 3 times faster than crawler-tractors. You change gears instantly, waste no time shifting, move up to 8 mph in reverse. Torque converter provides the equivalent of an infinite number of gear ratios, automatically selected to balance load and torque.

Drives to work . . . anywhere

Tournatractor travels at speeds to 19 mph from job-to-job. Big, low-pressure tires drive anywhere without need for planking, trailers, loading or unloading.

Simple . . . less maintenance

Lubrication takes less than 5 minutes on Tournatractor, compared to 15 minutes or more on a crawler. Cleaning of tracks and fittings is eliminated. Self-cleaning tires last 2 to 3 times longer than tracks.

Anti-friction drive

208 hp diesel drives through dirt-sealed anti-friction bearings to free-rolling wheels. There is no grinding wear of sand, dirt, and mud as in driving with multi-part crawlers.

Provides emergency electric power

Flywheel-mounted generator produces electricity to operate blades and PCU, and in emergencies you can tap into this handy electric source for floodlights, power tools.

Easier to operate

Less jolt and jar on low-pressure rubber tires reduces stress and strain on both operator and machine. Simple electric controls permit operator to work faster, with less end-of-day fatigue.

Improves safety

Low center of gravity, all-around visibility, accessibility, and quick response of electric controls make Tournatractor exceptionally safe to operate. Its multi-disc air brakes have *four times* the braking surface of most big tractors and trucks.

Interchangeable equipment

Bulldozer, Angledozer, Root Rake, Snow Plow, Snow Wing, Push Block, Logging Winch, Tree Pusher, are also available.

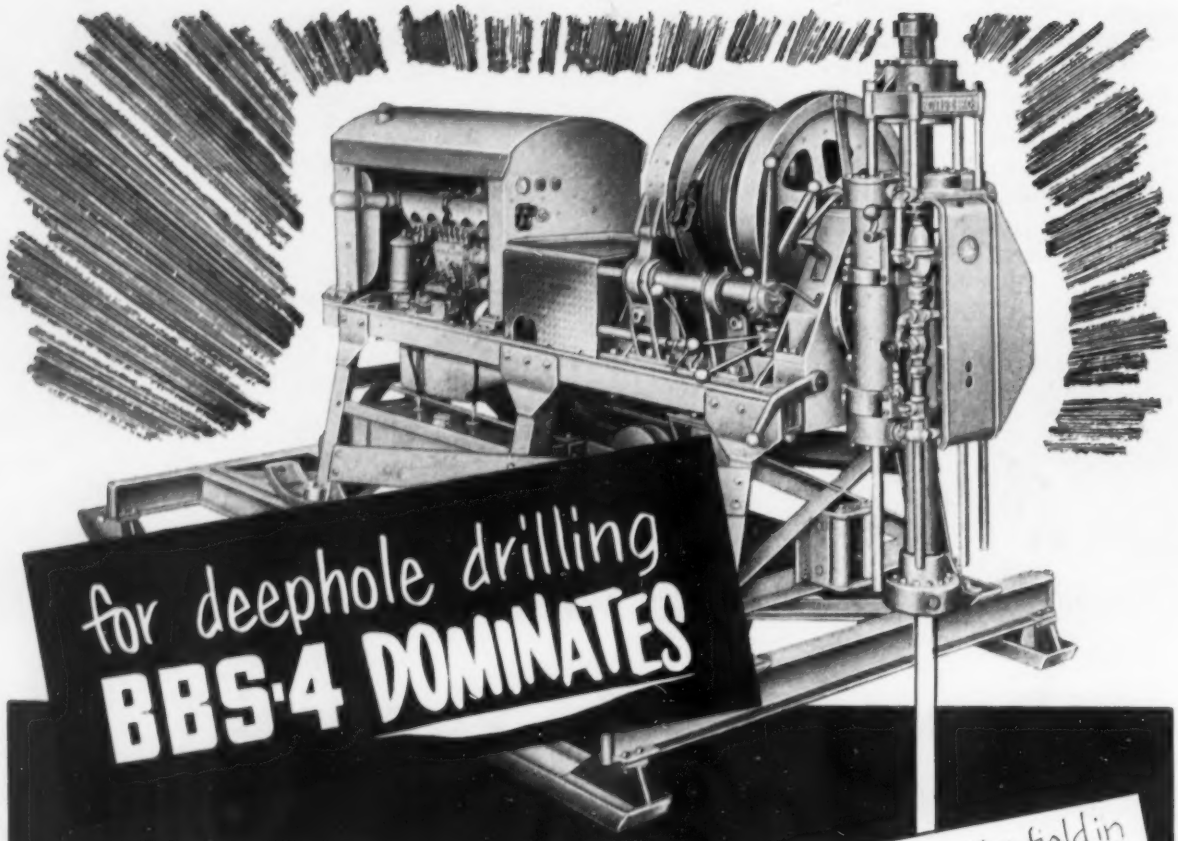
Ask your LeTourneau-Westinghouse Distributor to help you analyze specific Tournatractor applications on your work. No obligation!

Tournatractor, Angledozer — Trademark Reg. U.S. Pat. Off. T-941-M-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company



for deephole drilling BBS-4 DOMINATES

CHECK THESE BBS.4 FEATURES:

Shown here with H size oil hydraulic swivelhead, (gear and friction feed swivelhead optional), this improved model BBS.4 surface drill is built as a single unit and drills at any angle to 5000 foot depths. Sub-base permits movement to and from hoisting position without altering swivelhead angle. Hoist operates forward or reverse in all 5 transmission speeds for lowering of drill string against engine braking power or fast return of hoisting plug. BBS.4 is also designed for rotary drilling with or without kelly drive. Standard power unit is 100 H.P. diesel. Bit speeds to 1500 R.P.M. Can be supplied with derrick for 30 or 40 foot pull.

NOTE THESE BBS.4 CAPACITIES:

BX (1⅝" Core — 2⅜"Hole)	5000 ft.
6" hole (Rotary)	2000 ft.
Maximum Hoisting Speed	800 ft. per min.
Cable drum capacity	300 ft. ¾" line
Weight without base	9300 lbs.
Weight of base	1800 lbs.

...dominates the field in VERSATILITY

...in SPEED

...in CONVENIENCE

DRILLS • BITS • EQUIPMENT • CONTRACTING

The World's Most Complete Diamond Drilling Service

BOYLES BROS DRILLING COMPANY LTD. VANCOUVER, CANADA

Boyles Bros. (Pty) Ltd., Johannesburg, South Africa • Boyles Bros. Drilling Co., Ltd., Newcastle-on-Tyne, England
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Dimitry Scalistiri, Athens, Greece • Thomas M. Nevin, Y. Cia., S. A., Mexico, D. F.

Do you have this kind of haul problem?

180° switch-backs; narrow, steep, one-way haul roads; tight quarters

The Standard Slag Company, of Youngstown, Ohio, is handling some difficult hauling problems at their magnesite ore mine, at Gabbs, Nevada. One-mile, one-way haul road is narrow and steep, with sharp 180° switch-backs, loading is on narrow benches. Dumping areas have restricted access. Compact, highly maneuverable machines were needed to handle the job. Standard picked 2 D Tournapull Rear-Dumps for the assignment.

Turns within 12'4" radius

Teamed with a ¾-yard Northwest shovel, the rubber-tired "D's" were opening up a bench for loading when photos were taken. Carrying 11 tons of waste rock, the Rear-Dumps hauled to a narrow 15-ft. wide area where material was dumped over a 100-ft. bank. When full scale mining operations begin, company officials report that the "D's" will haul 500 tons of ore daily to the crushing plant over the winding mile-long road notched into the mountain side.

The two Model D Rear-Dumps have replaced three 8-cu. yd. trucks and are operating at lower hourly cost than the trucks. Records show that, excluding cable, repair parts cost only $257 during 13 machine months use.

Easy to control

"D's" on this job reduce the "hard-work" element by simple fingertip electric controls. Operators have no big steering wheels or manually operated shifts and levers to fight. Fatigue is greatly reduced. Operator C. E. Metcalf reports, "These 'D's' are very easy to control. In fact they are easier to operate than trucks." The Superintendent on the job said, "The D Tournapull Rear-Dumps can't be beat on our narrow bench job."

Safer than trucks

You'll find as did the Standard Slag Co., that D Rear-Dumps are safer than any trucks where loading, hauling and dumping areas are limited. Three important reasons why "D's" offer greater safety are:

1. multi-disc air brakes with 2,822 sq. in. of braking surface, more braking surface on a single wheel than most haulers have on all four;

2. positive power steer through geared king-pin which gives 90° turning, and sure safe control at all times;

3. front-wheel drive which keeps power and traction on solid footing well ahead of rear wheels during dumping. These safety features give operators more confidence on steep grades and narrow roads, as well as when dumping loads over high banks.

¾-yard shovel loads "D" with 11 tons of waste rock. 90° turning ability of unit allows quick spotting on narrow shelf. Wide target permits faster loading.

With front-wheel drive and powerful 4-wheel brakes, unit backs safely to edge of 100-ft. bank, dumps load clean at touch of switch.

Check the advantages of D Rear-Dumps for yourself. See how their maneuverability can speed cycles, cut costs, and increase your profits. Write or call for more information today!

Tournapull—Trademark Reg. U.S. Pat. Off. DR-915-M-bww

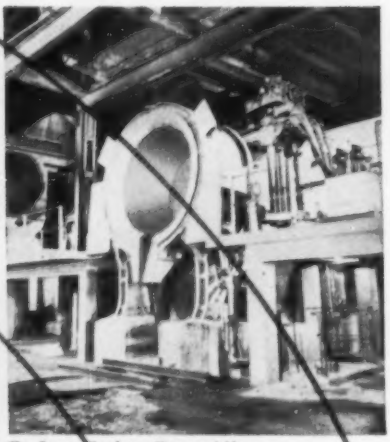
LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

Matte and Speiss Smelting

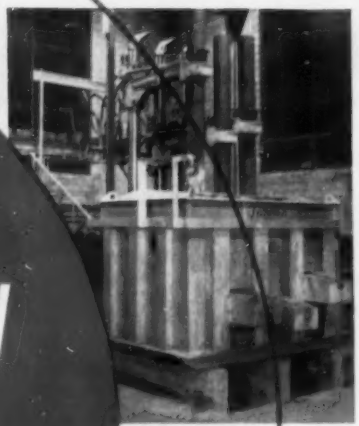
Copper Melting



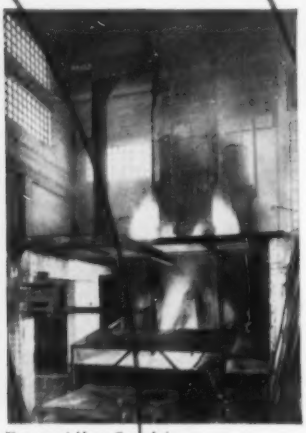
On Low Carbon Ferro-Alloys

Lectromelt* Furnaces really get around—

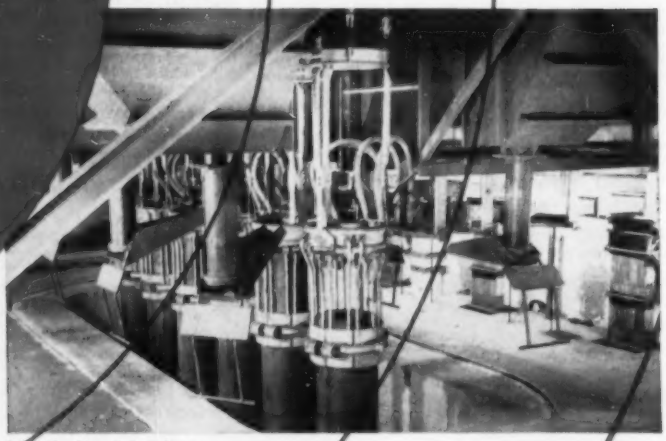
Catalog No. 105 describes furnaces for Smelting and Refining. For a copy, write Pittsburgh Lectromelt Furnace Corporation, 324 32nd Street, Pittsburgh 30, Pennsylvania.



Pilot Plant Research



Ferro-Alloy Smelting



"Six-in-line" Smelter

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

YOUR WICKWIRE ROPE DISTRIBUTOR SUPPLIES THE ANSWERS TO WIRE ROPE PROBLEMS

One of the best ways to find out "what goes" is to be right on the spot. That's why a Wickwire distributor is a wire rope expert—he practically lives with the industries he supplies with wire rope. He knows his customers' specialized problems from first-hand experience, and is able to give competent practical advice on the best construction—6x19, 6x37, 8x19, etc.—for them to use. And he delivers the type, size and length of wire rope they need directly from his warehouse stocks. They save time . . . storage space . . . paper work.

Your Wickwire Rope distributor is a good man to know. He's quality people handling quality products. Buy your wire rope and wire rope slings from him. You'll find that the many valuable services he offers far outweigh any apparent price advantage you might gain by buying direct.

CF&I WICKWIRE ROPE A CF&I PRODUCT

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

3153

Prospecting. The 'Jeep' Truck is a workhorse for towing equipment over rough areas. With the extra traction of its 4-wheel drive, it reaches off-road areas where there's work to be done. Its partner, the Universal 'Jeep' is equally adaptable for prospecting needs.

How the 4-Wheel-Drive 'Jeep' family does more jobs better...faster!

Mobile Power. This 4-Wheel-Drive Universal 'Jeep' takes a mobile welder to out-of-the-way locations. With power take-off, the 'Jeep' also operates compressors, generators, drills and winches.

Transportation. The 4-Wheel-Drive 'Jeep' Truck transports men, tools and equipment between mines or wherever they're needed. Keeps maintenance service and supplies moving smoothly.

'Jeep' 4-Wheel-Drive vehicles are proving their value and versatility every day in every phase of the mining industry. From exploring or prospecting in remote areas to keeping maintenance work and service moving smoothly, they demonstrate their versatility. With the extra traction of their 4-wheel drive, they haul ore trailers in trackless mining — up steep inclines, or over rocky ledges. And for travel on good roads they shift easily into 2-wheel drive. Versatile 4-Wheel-Drive 'Jeep' vehicles pay for themselves in a short time because of their adaptability to many jobs, economical performance, long life and low maintenance costs. See your 'Jeep' dealer or write for information.

The 'Jeep'®

family of 4-Wheel-Drive vehicles

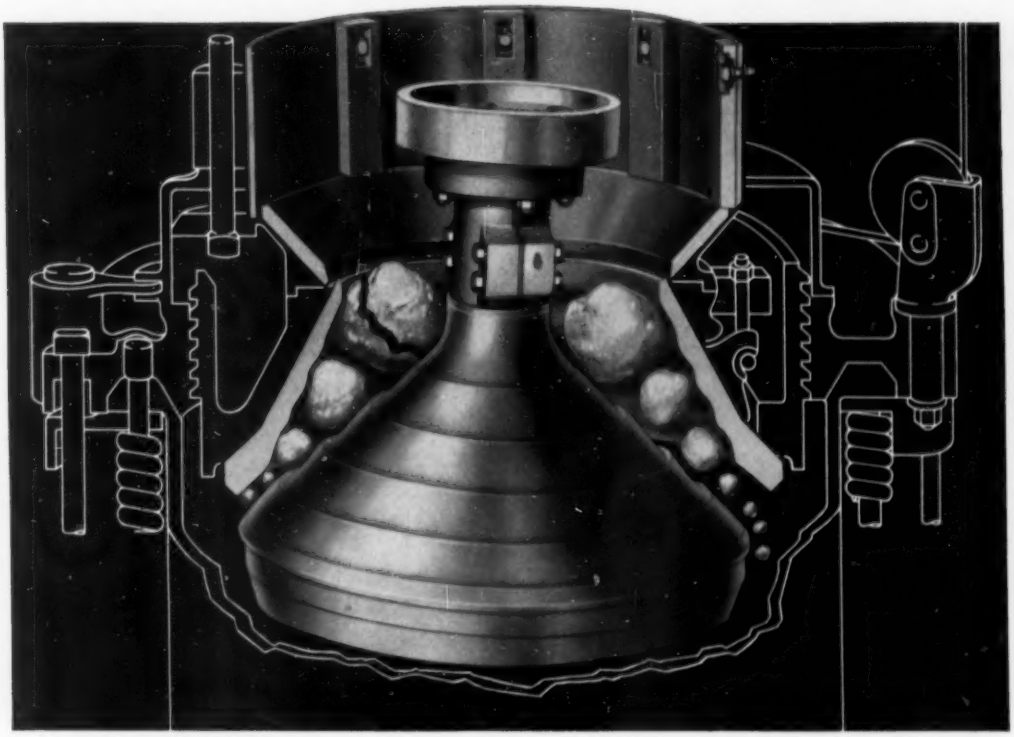
WILLYS...makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

AMSCO® CRUSHER PARTS

"give" a little to

TAKE MORE PUNISHMENT



Amsco crusher parts are made of the toughest steel known—manganese steel. Typical of the Amsco line are the mantle and bowl liner in this sketch of a Symons® Cone Crusher. Symons is a registered trademark of Nordberg Manufacturing Company.

Under the violent crushing forces of impact, abrasion and pressure, the surface of Amsco manganese steel crusher parts work-hardens to as high as 500 Brinell. Yet beneath the working surface, the metal remains strong and ductile . . . able to *give* slightly under crushing forces . . . developing hardness as a new working surface is exposed by wear. That's why manganese steel crusher parts last so long, enduring severe abuse and resisting cracking or chipping even when worn thin.

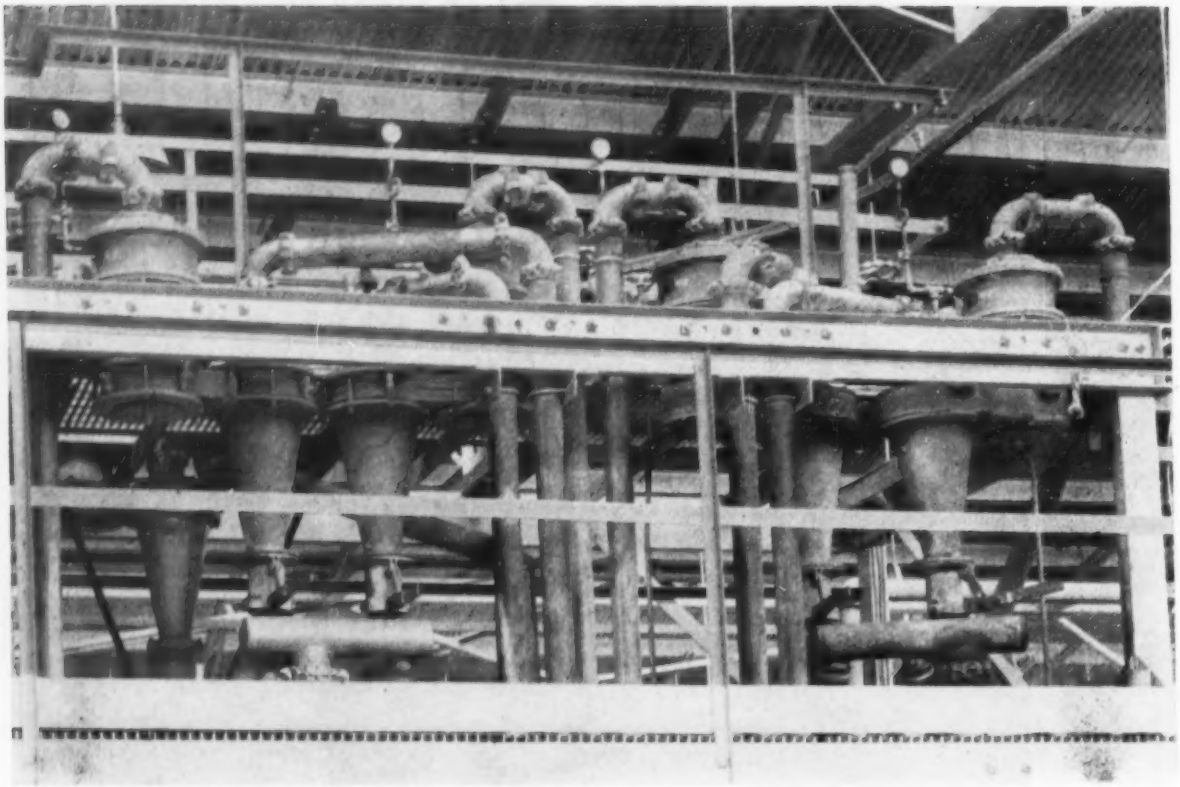
Amsco makes manganese steel crusher parts for most manufacturers of crushing, grinding and pulverizing equipment. Buy your replacement parts from your crusher manufacturer to be sure of getting Amsco manganese steel.

Amsco also produces other alloy steels with maximum wear resistance under particular service conditions.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

Simultaneous 98% rejection and recovery at 200 mesh by new cyclone design



Krebs Integral Two Stage Cyclones

Krebs Integral Two Stage Cyclones attain this remarkable performance by recycling critical sizes from the secondary overflow back to the feed. It is in effect two stages of cyclones, but synchronized and fed by one pump. Rejection of −200 is the prime objective but the primary cylinder's efficiency holds the losses of +200 below 2%. If the objective were to produce a −325 mesh overflow these versatile two stage units can be fitted and adjusted to do so. The accomplishment of this plant was predetermined by full scale investigation in the pilot plant of Equipment Engineers. After a year's operation the molded replaceable pure gum rubber linings, precision fitted to steel shells, show negligible wear.

	Feed	*Overflow*	*Underflow*
TPH	75.0	31.0	44.0
% Solids	26.0	13.7	70.0
GPM	968	825	143
% + 35	0.4		0.7
+ 48	2.3		3.9
+ 65	17.1		29.2
+ 100	28.9		49.2
+ 200	10.0	2.3	15.5
− 200	41.3	97.7	1.5
	100.0	100.0	100.0

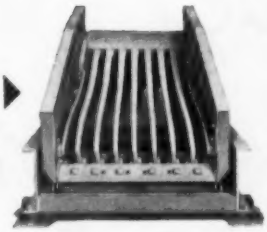
EQUIPMENT ENGINEERS INC.

41 SUTTER STREET **SAN FRANCISCO 4, CALIFORNIA**

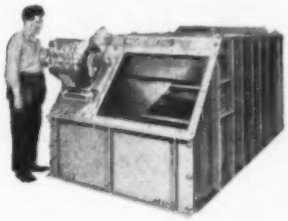
for GREATER CAPACITY and BETTER SCREENING . . .

USE

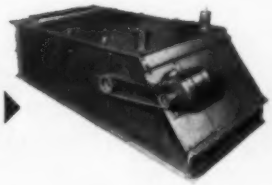
SYMONS® SCREENS ALL THE WAY



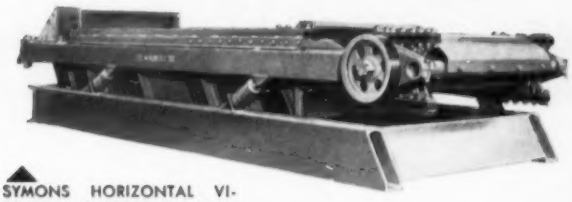
SYMONS VIBRATING BAR GRIZZLIES for heavy duty large capacity primary scalping where clear spacings of 1½" and larger are permissible. Up to 500 tph, handling feeds ranging to 30" and larger.



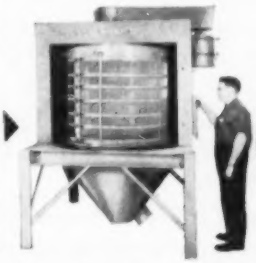
SYMONS VIBRATING ROD GRIZZLIES for heavy duty big capacity scalping. Up to 500 tph, for feeds up to 12". Ideal for scalping operations requiring relatively coarse separations in the range between 1" to 4".



SYMONS ROD DECK SCREENS employ a highly efficient screen deck utilizing individual replaceable steel rods. Features low screening cost—big capacity—low maintenance — long life — ideal for moist and sticky materials.



SYMONS HORIZONTAL VIBRATING SCREENS for level, positive screening with greater capacity of more accurately sized products. Variety of deck combinations, permitting production of a wide range of sizes. Available with dust housing. Ideal for hot, dusty screening with outside drive away from dust and heat.



SYMONS V-SCREENS give unequalled high capacity for sharp, single cut, wet or dry separations, especially in the finer sizes. This high capacity, sharp separation is the result of centrifugal force—an exclusive Symons V-Screen feature.

SYMONS VIBRATING SCREENS have been serving the mining and quarrying industries for over twenty years. The wide range of types and sizes enables you to select exactly the *right* screen for your particular application.

These quality screens have gained an enviable reputation for dependability, efficiency and economy . . . backed by the same high standards of accuracy, design and workmanship, and the same advanced engineering that is used in the manufacture of *all* Nordberg Machinery.

Mail the coupon for further details.

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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MAIL THIS COUPON TODAY MW

NORDBERG MFG. CO., Milwaukee, Wisconsin

☐ Symons Bar Grizzlies ☐ Symons Rod Grizzlies
☐ Symons Rod Deck Screens ☐ Symons V-Screens
☐ Symons Horizontal Screens

Name _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____

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Why is P&H *of the*

MAGNETORQUE* and ELECTRONIC the only modern

These revolutionary advances in design and performance of electric shovels are just two of the reasons why operators and owners are pointing to P & H for their outstanding achievement in electric shovels . . . why P & H now is at the head of the Big Three . . . why P & H can promise you the only modern electric shovel.

Just think! Power transmission *without friction's* in massive electric shovels. Boosts efficiency. Cuts maintenance and operating costs. *This is Magnetorque.* Exclusive with P & H.

Just think! Complete control of dig, hoist, swing and propel of these giants with simple stepless control. 12% faster cycles; 16% savings in operating time. *This is Electronic Control.* Exclusive with P & H.

For complete information, call your P & H representative. Electric Shovel Division, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

For Modern Engineering, Look to

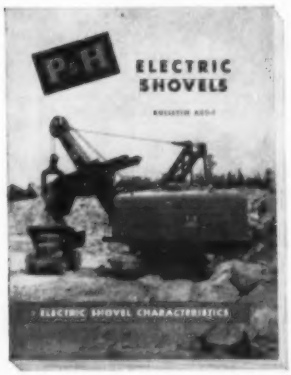
HARNISCHFEGER

P&H

ELECTRIC SHOVEL DIVISION

at the head Big Three?

CONTROLS give operators electric shovels

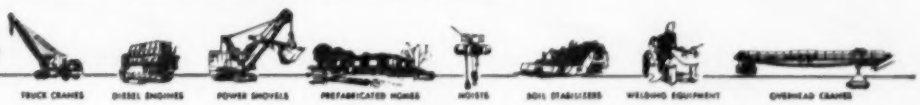


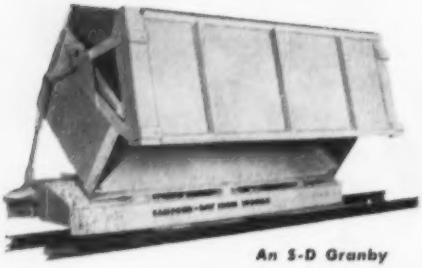
For a clearly illustrated description of Magnetorque* and how it sets a new standard for electric shovel design and operation, write for Bulletin X-156. Other booklets available on electric shovel models from 3 to 10 cu. yd. capacity. A copy of these publications will be sent those who request it on their company letterhead.

*T. M. of Harnischfeger Corp. for Electro Magnetic Type Coupling

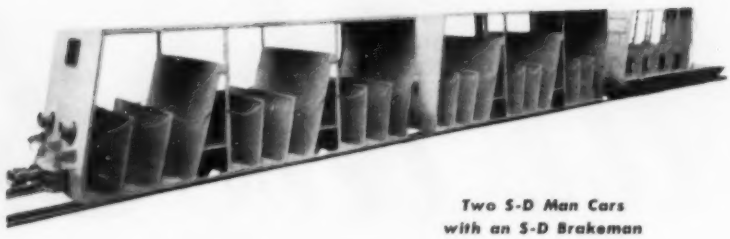
CORPORATION *Milwaukee 46, Wisconsin*

the P&H *line*





An S-D Granby

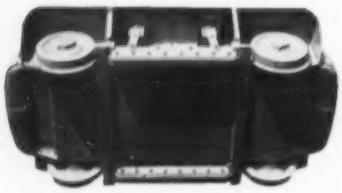


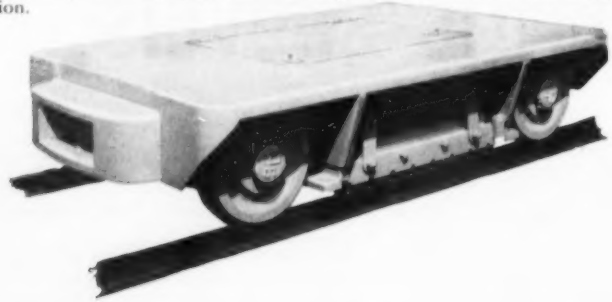
Two S-D Man Cars
with an S-D Brakeman

Samford-Day... Super

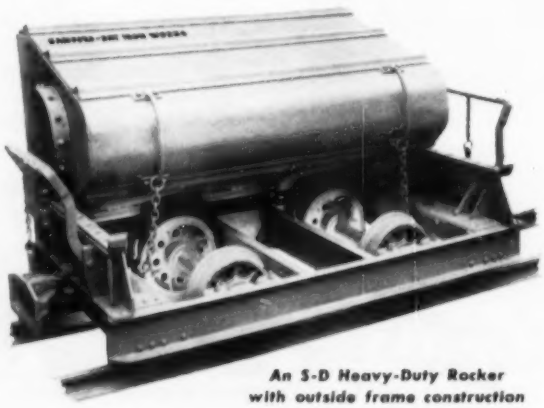
Now you can eliminate skids and additional locomotives for braking trips downgrade!

YOU NEED NO LONGER resort to skids or costly locomotives for extra braking power. We have developed a special car for braking that incorporates electrically operated magnetic brake shoes. Several are already on the job in metal mines. The S-D Brakeman Car is built to meet your particular requirements. It may be used between locomotives . . . between locomotive and cars . . . between cars or at end of a trip to prevent runaways due to coupler failures, etc. Controls can be provided at locomotive operator's fingertips. Top photo at left shows the compartment for batteries and motor-generator set. Lower photo shows the pair of brake shoes. One or several pair may be used, depending on requirements. Ask us for more information.

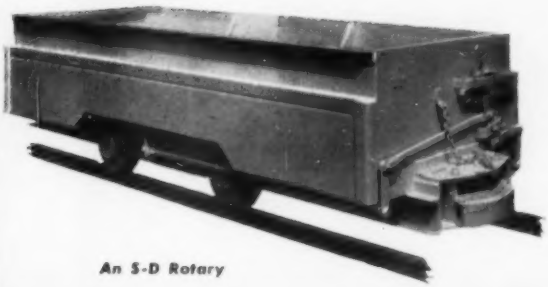




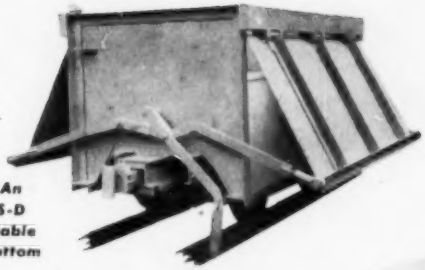
An
S-D
Rocker



An S-D Heavy-Duty Rocker
with outside frame construction

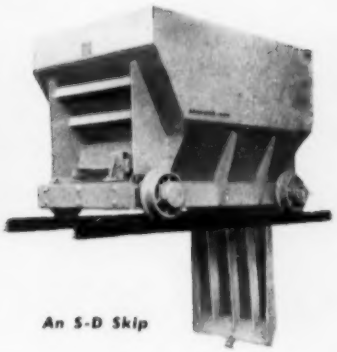


An S-D Rotary



An S-D Gable Bottom

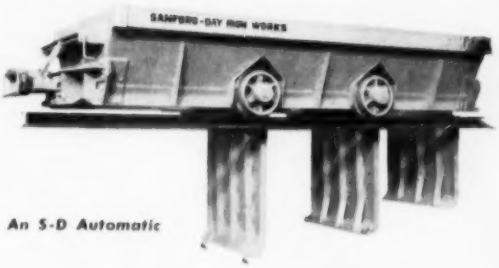
Market for mine cars



An S-D Skip

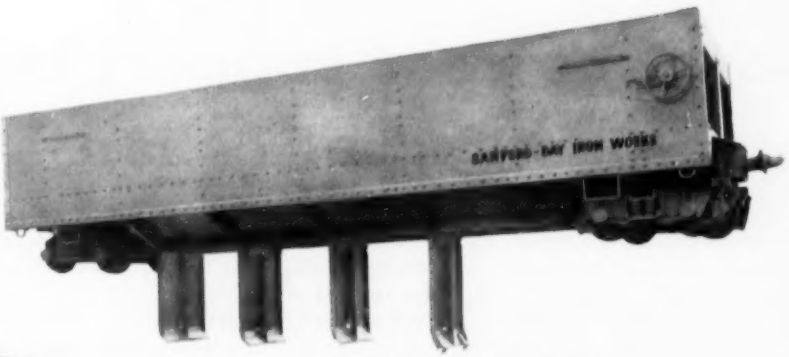
IS THERE SOMETHING SPECIAL you need in mine cars—a feature to meet your particular requirements? You probably will find the answer in our plant. Down through more than 50 years of car building experience we have solved the major problems of mine haulage.

Regardless of the type car you need, we build it . . . cars so constructed to give you more years of service with the least maintenance. Shown here are but a few of scores of all types S-D Mine Cars regularly being built for metal and non-metallic mines. All are designed and constructed to give superior service for the lowest dollar. Whether you need one car or 101, don't hesitate to get one of our engineers into your mine—face-to-face with your problem. With this type of cooperation, plus our facilities and capacity to build any type mine car of any size, any haulage problem in your mine can be solved. *SANFORD-DAY IRON WORKS, Telephone 3-4191, P. O. Box 1511, Knoxville, Tenn.*



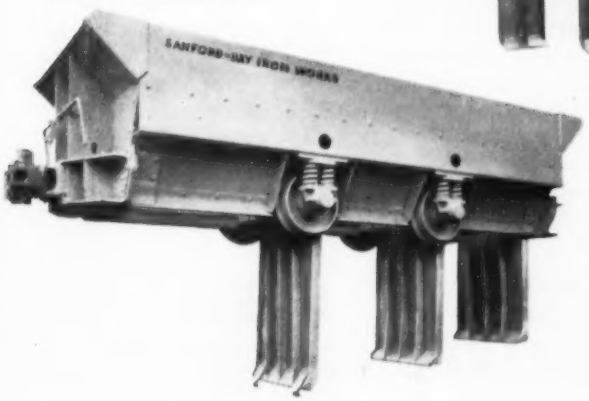
An S-D Automatic

● ASK US ABOUT THE S-D GISMO . . . the self-loading transport that promises big new economies in mining. It merits thorough investigation by any firm excavating rock or its equivalent.



An S-D Automatic with spring-mounted trucks

An 8-wheel S-D Automatic



Sanford-Day IRON WORKS

KNOXVILLE • TENNESSEE

AND BROWN-FAYRO DIVISION

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS CAR RETARDERS - SPOTTERS PUMPS - OIL SPRAY SYSTEMS

Now . . . a roof support that gives instead of collapsing

Here's a mine-roof control that's both safe and economical. It's called the Bethlehem Yieldable Arch because the arch yields instead of bending or buckling under excessive underground pressures.

The Yieldable Arch is made up of U-shaped segments heavily flanged to resist collapse and torsional stresses. Segments are joined by means of U-bolt clamps, creating friction joints which slide or yield before deformation can occur.

The yielding of the roof support permits the natural relaxation and stabilization of the surrounding strata. At the same time, the increased overlapping of the segments strengthens the arch and adds to safety in the mine.

Individual arches are tied together by horizontal struts which are clamped to the arch with special J-bolts. The struts help the arches to reinforce each other, and transmit lateral forces from one arch to the other. We can also furnish steel lagging with the arches, if desired.

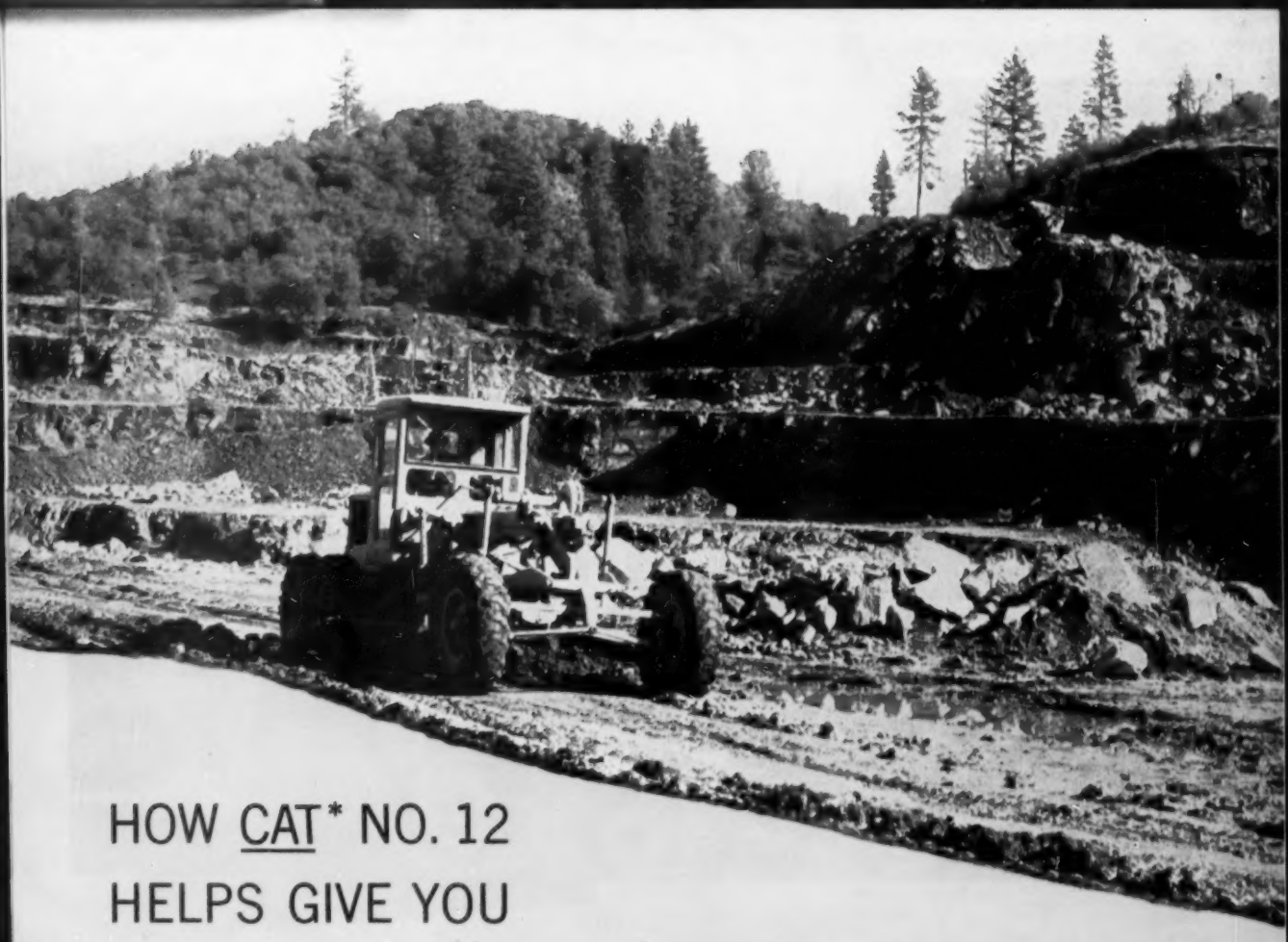
The Yieldable Arch is easy to install, and has a high recovery value. It should pay for itself in its first year. A Bethlehem Pacific engineer is ready to give you the full story.

BETHLEHEM PACIFIC COAST STEEL CORPORATION

Sales Offices: Los Angeles, Phoenix, San Francisco, Portland, Seattle, Spokane

BETHLEHEM PACIFIC

BETHLEHEM STEEL



HOW CAT* NO. 12 HELPS GIVE YOU "LOWER COST PER TON"

OUT IN San Andreas, Calif., this Caterpillar No. 12 Motor Grader works eight hours a day, five days a week, the year around. It maintains haul roads and plant roads around the limestone quarry of Calaveras Cement Co. Plant manager Grant W. Metzger says, "We like the dependability of the machine and its ease of maintenance. Cat equipment gives us lower cost per ton."

Like all Caterpillar Motor Graders, the No. 12 is a balanced unit, built—not merely assembled—by a single manufacturer. Engine, blade capacity and working speed are carefully matched for maximum efficiency.

In addition to traditional Caterpillar ruggedness and freedom from down time, the No. 12 now has important new features for even higher production at lower cost on *your* operation:

NOW—TUBELESS TIRES. Available at no extra cost, they eliminate an estimated 80% of down time caused by tires. Tubeless tires are easier and quicker to mount, hold air longer, run cooler, and give better puncture and blowout protection.

MONEY-SAVING OIL CLUTCH. Special cork facings are bathed in oil for cooler operation, less fade, longer life. Facings wear an average of only 2½ thousandths of an inch per 1000 hours of operation; can give you 1500 hours without clutch adjustment.

Your Caterpillar Dealer is a *single reliable source* for skilled service and factory parts. Call him today for a demonstration of the Caterpillar Motor Grader—No. 12, No. 112 or No. 212—that will do most work for *you* at lowest cost.

Caterpillar Tractor Co., Peoria, Ill.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

99% OF ALL CAT MOTOR GRADERS ARE STILL IN USE

Improved Du Pont CD Blasting Machines

FASTER OPERATION—LESS MAINTENANCE

Improved performance during an extra-long service life is what you get from the newer Du Pont CD Blasting Machines.

Designated CD-32-1 and CD-48-1, these newly designed machines maintain the condensers in a fully charged condition at all times . . . preventing condenser deterioration and reducing current drain from the batteries to a negligible quantity. This keeps the condensers at the same potential as the batteries. Result: greatly prolonged battery and condenser life, less need for service in the field.

The continuous-charge feature also eliminates the elapsed time between depressing the ready switch and the lighting of the neon lamp. As soon as the ready switch is pressed, the light glows, and the blast can be fired at once by pushing firing button. Result: faster operation.

These powerful, efficient machines retain the excellent characteristics of all CD Blasting Machines: lightweight . . . great safety . . . no moving parts . . . absence of costly permanent shooting lines . . . ability to fire large numbers of caps in series or parallel series.

If you would like complete information on the improved CD-32-1 and CD-48-1 Blasting Machines, see the Du Pont explosives representative in your area, or write to E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Del.

OWNERS OF CD-32 and -48 BLASTING MACHINES may have them converted to the improved CD-32-1 and -48-1 machines for a moderate charge. Ask the Du Pont representative in your area for details.

DU PONT EXPLOSIVES

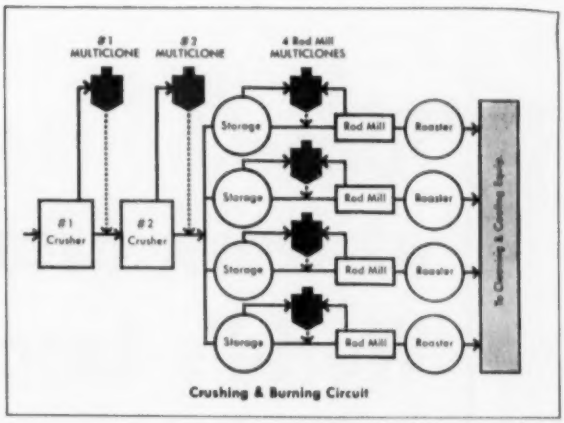
Blasting Supplies and Accessories

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

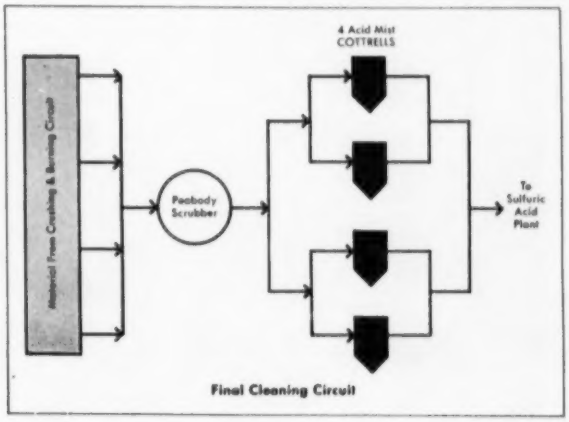
6 MULTICLONE
DUST COLLECTORS



Crushing & Burning Circuit

and 4 Western Precipitation COTTRELLS *serve Anaconda at Yerington!*

These Cottrells are the newest Western Precipitation acid mist design



Final Cleaning Circuit

Anaconda selected six Western Precipitation MULTICLONES *and four Western Precipitation* COTTRELL *Electrical Precipitators to handle key recovery operations at its new $30,000,000 Yerington installation.*

THE 6 MULTICLONES are installed in the sulfur crushing plant where sulfur ore is crushed and ground for use in the Roaster operations. Since this crushing and grinding develops a considerable dust problem, the primary crusher (a jaw type), the secondary crusher (a cone type), and each of the 4 rod mills has an individual 9VG Multiclone Mechanical Collector installed for recovering suspensions from the exhaust gases.

So efficient are these Multiclones that the exhaust gases are practically free of all visually discernible dust!

Inasmuch as each crusher and mill has its own Multiclone unit, maximum flexibility in plant operation is achieved—with greatly simplified duct and dampering requirements. Savings in plant maintenance are also obtained by having the Multiclones ahead of the fans so that abrasive dusts are removed and only the clean gas reaches the fan equipment.

THE 4 COTTRELLS are installed in the acid plant process to electrically precipitate the acid and water mist from the SO_2 gas generated in the Fluosolid Roasters. From the Cottrells the gas passes directly into the contact acid plant where it is converted into sulfuric acid.

The four Cottrells have 100 pipes each, and are designed for a capacity of 33,900 cfm at 110°F. with a negative pressure of 30″ w.g. and a recovery efficiency of 99.0%!

These Cottrells are the first acid mist precipitators to incorporate a new advancement developed by Western Precipitation engineers... top support of the high voltage electrode system coupled with wind-swept insulator compartments. This new design eliminates difficulties associated with conventional oil-sealed insulator compartments and is a major advancement in this type of Cottrell design.

The Weed-Heights installation is one more example of the flexibility and adaptability of Western Precipitation recovery equipment to varying operating requirements. Remember — Western Precipitation designs, engineers and installs BOTH *electrical* (Cottrell) and *mechanical* (Multiclone) recovery systems — therefore can give an unbiased recommendation on the type best suited to your particular requirements. A wire, letter or phone call to our nearest office places this unmatched "know-how" at your service!

Send for helpful literature!

® "Multiclone"

WESTERN Precipitation CORPORATION

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1036 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

Allis-Chalmers Crawler Tractors at work around World's Largest Copper Mine...

On the Haul Road to settling basin dike, this HD-21 levels fill. Here, torque converter matches tractor speed and push to load and terrain conditions . . . puts maximum power to work at all times moving big loads. Husky Allis-Chalmers diesel engine with follow-through combustion provides more power at most effective crankshaft angle . . . burns fuel completely . . . eliminates combustion knocks.

On the Dike this HD-21 dozes sandy fill. Truck wheels, idlers and support rollers require lubrication only at thousand-hour intervals. With Positive Seals that keep grease in, dust out, the HD-21 works efficiently in gritty materials.

Utah Construction Co.'s three HD-21's help build an addition to the settling basin dike for large western open pit copper mine

Where the jobs are the toughest, you will find Allis-Chalmers big HD-21 torque converter drive crawlers. That's why Utah Construction Co., owner of a fleet of HD-21's, put three of them to work on this mining job—raising the dike around the immense settling basin near the copper mills of a large open pit copper mining company. These advanced design crawlers are delivering big work output, steady operating dependability with low maintenance costs . . . handling clean-up around a shovel in the borrow pit, building haul roads, leveling fill on the dike. Read some of the reasons why.

On the Dike, an HD-21 levels fill. Narrow cowl and tapered hood give operator top visibility . . . big foam-rubber seat, convenient controls and finger-tip hydraulic steering make his job easier . . . reduce undue fatigue.

In Borrow Pit another HD-21 handles cleanup work to speed loading of hauling units by the shovel. Tru-Dimension machined and heat-treated track provides maximum toughness and wearability . . . gives longer track life in abrasive materials.

See your Allis-Chalmers Dealer. Let him tell you about features built into the HD-21 that no other tractor in its size class has—all-steel box-A main frame; one-piece steering clutch and final drive housing; straddle-mounted final drives; "wrap-around" radiator guard and others.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WIS.

ALLIS-CHALMERS

LESS WASTED DRILLING TIME !

TIMKEN® interchangeable rock bits let you switch bit types without switching drill steels

Dozens of different TIMKEN® multi-use and carbide insert bits fit the same steel

YOUR drillers can change Timken® interchangeable rock bits quickly, easily, right on the job. They won't waste valuable drilling time going after a different set of drill steels every time a different bit type is needed. They'll simply unscrew one type of Timken bit and screw another right on the same steel. And they can make this change in one minute flat!

You get extra drilling economy because your drillers can always switch to the most economical bit as the ground changes—right on the job. And because dozens of different Timken multi-use and carbide insert bits fit the same steel, you don't have to carry an expensive inventory of drill steels.

Both Timken carbide insert and multi-use bits are made from electric furnace Timken fine alloy steel. Both have special shoulder unions that keep drilling impact from damaging threads.

Our rock bit engineers are experts at cutting drilling costs. Maybe they can save you some money? Drop them a line. There's no obligation. Write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small diameter holes, very deep holes.

... your best bet for the best bit... for every job

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

GM DIESEL
CASE HISTORY No. 556-188

OWNER: Badgett Mine Stripping Corporation, Madisonville, Ky.

INSTALLATION: GM "6-110" Diesel-powered Bucyrus-Erie 3-yard shovel loading fleet of GM Diesel-powered Euclid rear dumps on Pennsylvania Turnpike extension project.

PERFORMANCE: Partner Brown Badgett says GM Diesels are "doing a wonderful job." He's running his shovel 10 hours a day, plans to start 24-hour operation soon.

"Doing a Wonderful Job"

FEW WOULD expect to find a mine-stripping contractor on a road-building job. However, where there's dirt and rock to be moved in a hurry it is *not* unusual to find a General Motors Diesel-powered excavator. The faster, livelier crowd and swing of a "Jimmy" powered shovel means more yards per day at a lower cost per yard.

Principal reason for this snappy action is that a GM 2-cycle Diesel delivers power on *every* piston downstroke—not on every *other* downstroke as in 4-cycle engines. That means faster acceleration, instant response to throttle demands, real "go" when the bucket takes a bite.

And a GM Diesel costs less to maintain, too. Valves cost up to 62% less, cylinder liners cost up to 40% less, than similar parts for other Diesels.

More than 150 different manufacturers pick GM Diesel power for over 850 different models of equipment they build. Your GM Diesel distributor can give you the list plus full information on GM Diesel engines. See him today or write direct.

DETROIT DIESEL
ENGINE DIVISION OF GENERAL MOTORS
America's Largest Builder of Diesel Engines
Single Engines . . . 30 to 300 H. P. Multiple Units . . Up to 893 H.P.

GM GENERAL MOTORS DIESEL POWER

Break it up to bite size...with APEX®

VERSATILE APEX explosives are an important factor in the amazing improvements in breakage now possible with the newest Atlas development . . . Alternate ROCKMASTER® combined with Alternate Velocity Loading.

Apex is an economical ammonium nitrate explosive with a patented assembly having a water-proof gelatin core that offers these advantages:

- **The water-proof core promotes complete detonation of the explosive in wet holes.**
- **Complete propagation of the column in any height face.**
- **Fluted-end cartridge permits easy loading.**
- **A wide range of strengths and velocities to choose from. Apex is available in 8 strengths: each in low, medium and high velocity.**

For maximum breakage, better control of throw and economical production, team APEX explosives with the ROCKMASTER Blasting System.

For complete information on all Atlas Explosives Products, ask your Atlas representative for a copy of the new Atlas Explosives Catalog.

ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY,
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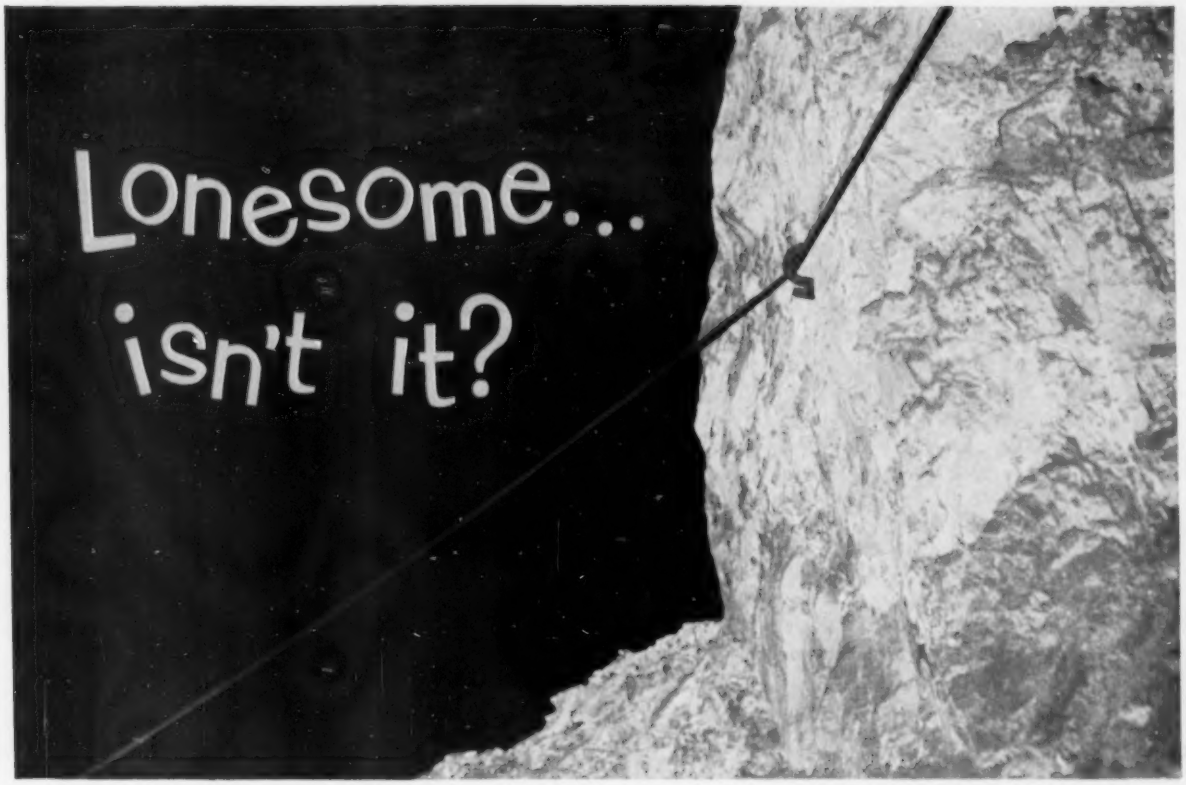


Photo courtesy American Zinc Co. of Tennessee

This Simplex-TIREX Cable carries 250-volt D.C. power to a 25-horsepower slusher hoist 800 feet from the main power line. The cable runs from pillar to pillar and is supported every fifty feet by a cane-shaped hanger wedged into the pillar.

The scraping of many hundreds of tons of ore per day rests upon the consistently satisfactory performance of this lone cable. Here is an operation where "cost cutting" by buying cheap cable simply cannot result in profit. Dependable day-in, day-out operation are primary requisites. Profits rest on it.

Simplex-TIREX Portable Cables are quality cables. They are engineered and manufactured to meet the toughest, most difficult operations that mining affords. They will withstand the blows of falling ore, spalling rock, etc. TIREX Cables were first made more than 35 years ago to meet and overcome the problems peculiar to mining. That's why you will find TIREX wherever you find mining.

Simplex-TIREX Cords and Cables are cured in lead to give you longer service. They are the only cord or cable that have the famous Selenium Neoprene Armor. When you next need a portable cable for slusher hoists, for loading operations, for electric locomotives, or for any other mining service, be sure that you specify and then insist that you get Simplex-TIREX Portable Cables.

Simplex

TIREX CORDS AND CABLES *are made only by the*

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

A PICTURE REPORT OF

INTERNATIONAL POWER

Boosting job production everywhere

"Tops for stripping overburden," reports Maurice Stein, Superintendent for Elliot Coal Mining Company, Philipsburg, Pennsylvania, of his company's TD-24's. "We've used two for three years now . . . find they give maximum output with very low maintenance. Our operators especially like their ease of handling and good balance. We also like their planetary steering system which lets our operator safely work on steeper terrain." Right now, rigs are removing 40 ft of shale and clay to uncover a 24-inch vein of "C" seam bituminous coal.

For utility work around pit or plant, 39½ dhp International 300 can be equipped to do most any task. Here, rig loads and unloads trucks. With other attachments, "300" plows snow, blades roads, loads bulk materials, digs ditches, mows grass, tows trailers. Rig has 10 speeds forward to 16.7 mph, develops 4,379 lbs pull.

Fast on job, fast between jobs—Handling all tractor work in a quarry near Denver, Colorado, 200 hp TD-24 saves time by driving from job-to-job at 7.8 mph. Output, 2200 tons of 1¼-inch stone per 8-hour shift, is taken from crusher by International-powered belt conveyor, background, then stockpiled by TD-24. Unit also does all stripping.

"Ideal for dozing rock," says Paul Weaver Supt for Joe Wenke Quarries of this veteran TD-14A. "We use it continuously for shovel and quarry-floor cleanup. Performance has been excellent. Downtime is way down due partly to rugged construction, partly to prompt parts delivery and service from our International distributor." Quarry, located at Toledo, Iowa, produces 200 tons of 1-inch road stone per hour.

3000-ft cycle every 3 min is the record of Western Construction Co.'s "55" Payscraper. This includes time for TD-24 to push-load 10 bank yds of ripped caliche. Payscraper's fast-loading ability makes it ideal for stripping overburden . . . high ratio of horsepower to loaded weight, oversize air brakes speed hauls up and down steep grades. Photo was taken near El Paso, Texas.

Loader does job too tough for shovel—In an assignment which dramatically illustrates the tremendous break-out International Drott can bring to bank-loading, Al Pangia's TD-14 rips up a 150-yd concrete filling station driveway in Camden, N. J. Engineers say a ¾-yd shovel could not have done the work . . . yet TD-14 broke and loaded the slab unassisted.

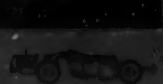
International

makes every load a pay load

INTERNATIONAL HARVESTER

Industrial Power

A machine size for every job . . . see your nearest INTERNATIONAL DISTRIBUTOR for details.



PAYSCRAPERS
13 yds. and 18½ yds.

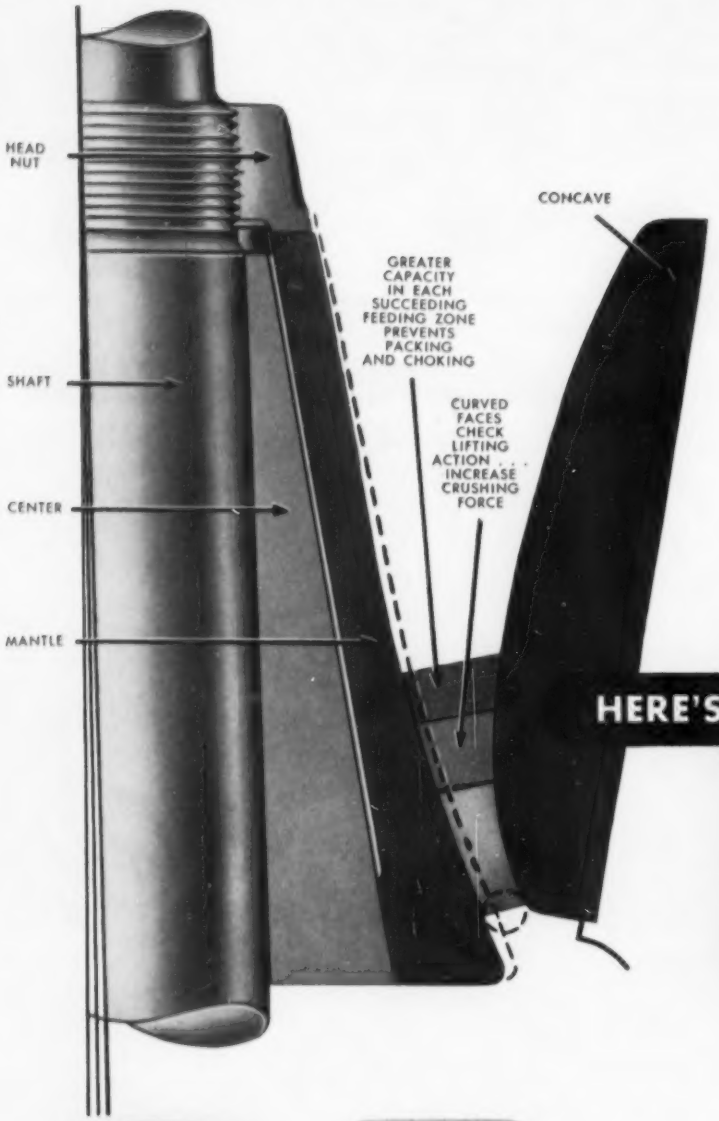
CRAWLER TRACTORS
8 Models . 40 to 200 hp

DIESEL, GAS ENGINES
8 Models, 36½ to 200 hp

WHEEL TRACTORS
5 Models . . 7 to 50 dbp

ALSO: International Drott Loaders . . . International Scrapers, Bottom-Dump Wagons . . . and International Superior Pipe-Boom Tractors

IT'S NO SECRET . . .


HEAD NUT
SHAFT
CENTER
MANTLE
CONCAVE
GREATER CAPACITY IN EACH SUCCEEDING FEEDING ZONE PREVENTS PACKING AND CHOKING
CURVED FACES CHECK LIFTING ACTION . . . INCREASE CRUSHING FORCE

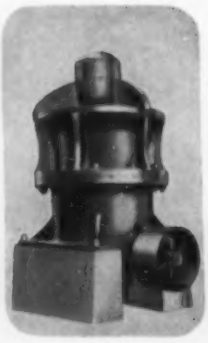
More than 806 operators all over the world know that a Traylor TY Reduction Crusher means peak production, economy of operation and less down-time for maintenance. This enviable reputation of efficiency and dependability on the job is the result of the many original Traylor design features built into these outstanding secondary crushers.

Of compact design, Traylor TY Crushers require a minimum of floor space and head room. All TY's feature Traylor original non-chokable Bell Head with spring suspension and Curved Concaves of Manganese steel . . . working surfaces which retain their original efficiency throughout their long life. The Bell Head and Curved Concaves form a crushing chamber in which each succeeding feed zone has a greater capacity than the preceding zone. This practically eliminates choking and packing . . . the cause of most bottlenecks and down-periods in crusher operations.

Traylor TY Reduction Crushers are available in six sizes, with feed openings ranging from 3" to 22" and capable of reducing from 4 to 590 tons of rock per hour. Get the facts on all the outstanding features of Traylor TY Reduction Crushers by sending for your copy of Traylor Bulletin #7112.

HERE'S WHERE YOU GAIN EXTRA TONNAGE WITH A TRAYLOR TY REDUCTION CRUSHER

A Traylor leads to greater profits



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PRIMARY GYRATORY CRUSHERS

ROTARY KILNS

BALL MILLS

JAW CRUSHERS

APRON FEEDERS

Drifts and Crosscuts

What's Happened to Alaskan Gold Mining and How Can It Be Saved?

To put it bluntly, the industry is slowly being strangled. Where there were once 30 to 40 operations in each of the four or five districts, today there are only three or four. The remaining operators are in danger of going under shortly. Experienced miners with proven managerial ability now have their backs to the wall with no relief in sight. The tragic part of the situation is that the gold still remains in the ground waiting to be exploited. But the successful old timers, with the energy and stamina of youth gone, are throwing in the towel one by one. The young man, who can furnish the necessary drive and aggressiveness, lacks the capital to develop and work potential, profitable deposits.

The current economic cycle can't be blamed entirely. True, the price of gold remains the same while supply costs have risen and labor demands a higher wage. Such conditions are bound to squeeze out marginal operators.

Lack of sound proper financing, however, is the biggest factor handicapping the Alaskan miner today. A man no longer is able to approach a Territorial or Seattle, Washington bank with a complete report showing what the potential of the property is worth and secure a short-term loan to finance the season ahead. Twenty years ago these same banks did a thriving business with the miners and the industry was in a sound, healthy condition. But today the borrowing power of the bank is limited. Most of the available funds have been drained off by contractors with fat defense contracts whom the modern banker is more prone to finance. The government projects now underway in Alaska have created a temporary, short-lived economic boom, but this won't last long. The destiny and future of Alaska is irretrievably linked to mining. Without the construction programs, mining is a powerful factor in the economic life of Alaskans.

To fully appreciate the plight facing the miner, one should have some understanding of the peculiar conditions of mining in the northern territory. First, the season is short. The average property can be worked only four or five months per year during the short summer; sometimes it's less, depending on the weather conditions. All activities—stripping, thawing, exploration, sampling and production—must be concentrated in this period.

A complicating factor is the time lag of several years which exists between the decision to mine and the start of actual production. At the outset, the overburden covering a placer deposit must be completely thawed and stripped. This may require a year at the very least and usually more. Then the exposed gravel must also thaw for a year before it can be exploited. An average small miner with a dragline and a couple of bulldozers capable of handling 2,000 yards of alluvium per day, should keep about 500,000 square feet of ground stripped of cover. This amounts to about two seasons of work. No one today is able to attain this goal.

The fine balance between the amount of ground developed ahead of actual mining was seriously disturbed by the infamous World War II War Production Board Order L-208 which shut down the gold mining firms.

Because he doesn't have the necessary financing, the gold miner lacks flexibility to carry on his program. He is forced to concentrate on production, and therefore he guts the ground in the hope of meeting daily expenses. Prospecting is almost at a standstill in Alaska today. If the miner can't examine potential new deposits, the throttling process is rapidly accelerated and the life of the mining enterprise shortened.

If an operator has a small- or medium-sized tractor, he can obviously improve efficiency of the operation, cut costs, and handle more gravel if he can buy one of the new, big bulldozers now offered by manufacturers. This is so simple that it's elementary. But here again the banker's inability to understand the problems of mining, or the drain of borrowing power by defense projects, make it practically impossible to replace the small machine.

The short working year for the gold miner also diminishes the depreciation advantage enjoyed by any other business. The equipment depreciates during the entire calendar year even though the season may be only four months long. Machinery may lose its full value long before it has outlived its usefulness. It is possible that by the time a property is readied for production a company is no longer able to write-off the cost of purchasing equipment.

What is required is the development of a sound program whereby the miner can borrow for his immediate needs and repay the loan from receipts provided by sane development and production of gold-bearing gravel. There is a real need for a lending institution capable of understanding the many problems faced by the Alaska miner. This institution should have a good conception of how placers are mined; it should be familiar with Alaskan conditions; it should be able to differentiate between a potentially good enterprise and a poor one in order to properly evaluate the need for financing.

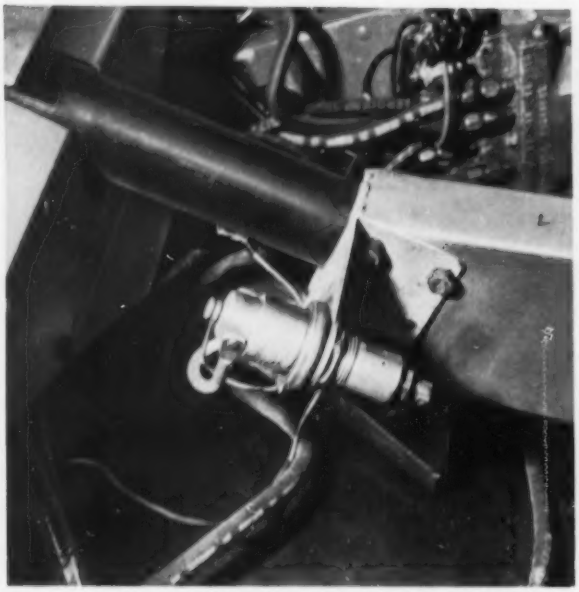
The Export-Import Bank makes loans to miners in foreign countries. Why can't the same thing be done for the Alaska miner? Perhaps financing is a job for the Small Business Administration. Maybe it should be a government sponsored agency handled by individuals with some knowledge of mining.

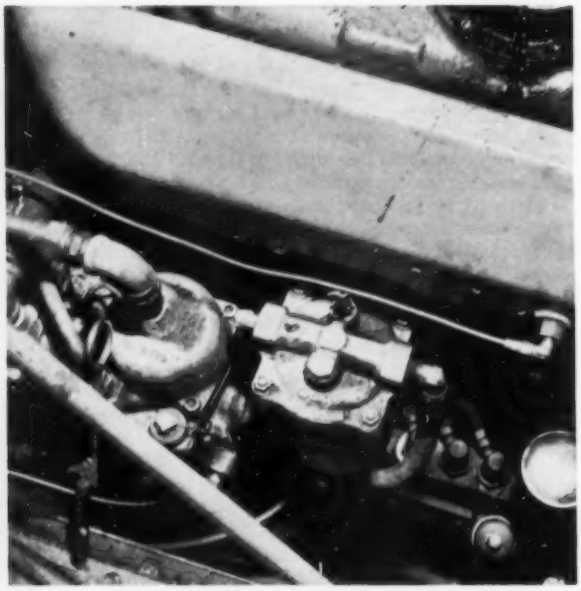
It is clear that a drastic course of action is necessary to save the industry. The importance of this fact can't be over-emphasized because traditionally the search for gold has uncovered deposits of other minerals which have profound economic significance to both Alaska and the United States.

The Engineer's Field Report

CASE HISTORY
PRODUCT Chevron Pressure Primer System
FIRM Consolidated Freightways Inc., Portland, Oregon

Pressure Primer System starts diesels on 1st or 2nd turn with regular batteries—at minus 40°





BELOW ZERO starting temperatures are common 5 months a year for Consolidated Freightways equipment operating in Mountain and Plain States. Two hundred and forty-four of the company's tractors are equipped with the Chevron Pressure Primer System. Since this installation, rigs start on first or second turn at 40° below zero—using regular equipment batteries! Normally in these sub-zero temperatures, regular batteries give out after about 4 turns. Sure starts plus the fact engines are primed with Chevron Pressure Primer bulbs, controlled from within the cab, saves Consolidated Freightways important man-hours and speeds operating schedules. Picture above (left) shows a Chevron Pressure Primer Discharger mounted on steering column. Highly volatile priming fuel is atomized through tubing into manifold (right) under 250 lbs. pressure.

FREE FOLDER tells you more about Chevron Pressure Primer System and how to install it on different engines. Write or ask for it today.

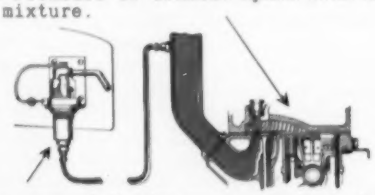
CHEVRON

TRADEMARK "CHEVRON" REG. U. S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies listed below.

Why Chevron Pressure Primer System helps starting

Volatile Chevron Priming Fuel atomizes in induction system at temperatures as low as −65°F. Pressure or weakest spark from engine fires mixture.



Simple, rugged discharger prevents fuel leakage. Small, safe steel bulbs protect fuel from water and dirt.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Capitol Concentrates

Domestic Miners Must Prevent The Smuggling and Sale of Mexican WO_3

Reports indicate that the Senate Interior and Insular Affairs Committee is not happy about the lack of progress in the government's manganese beneficiation program since hearings were held on April 12, 13, and 14 of 1955. There is some talk among members of the Subcommittee on Minerals, Metals and Fuels of holding another set of hearings, perhaps in April of 1956 when a year will have elapsed. Committee members want to find out what progress has been made in each case touched on in the 1955 hearings, and if any attempt has been made to carry out the recommendations of the subcommittee's manganese report of September 26, 1955.

• Maximum Penalty Is Deserved

The Mexican tungsten scandal has been blown up out of all proportion to its dollar value as probably only between $100,000 and $200,000 is involved in the fraud, according to reliable GSA sources. Nevertheless, the mining industry has been given a black eye.

Smuggling and sales to GSA under the guise of the material's being of domestic origin had to have the connivance of United States citizens who were only too eager to defraud Uncle Sam and split with Mexican producers. Of course the Mexican tungsten met specifications, or it would not have been accepted, so it might be argued that the government took no actual loss. The real loss will be taken by legitimate domestic operators, part of whose quota will have been filled by these renegade shipments which help to bring the program to a close that much sooner. Obviously, it is the duty of all producers to disclose any tampering with the domestic strategic mineral purchase programs for their own protection if for no other reason. The maximum punishment should be meted out to those crooks!

• Mineral Advisory Groups Are Formed

The completion of the 14 mineral advisory committees composed of industry members presumedly from small, medium and large enterprises has been announced. The old advisory committee, which was supposed to advise the Secretary of the Interior and which was disbanded at the instance of the Justice Department, was loaded with members from big business. The present groups are supposed to advise the Office of Minerals Mobilization and it will be very interesting indeed to see what influence they have upon the decisions of that body. Of course, whatever OMM recommends must be passed upon by the office of Defense Mobilization which, in any case, has the final say. Anyway, it makes a sweet buck-passing setup.

• Interior Department Is Alarmed

Rumors in Washington indicate that Interior Secretary McKay has become alarmed at the possible political repercussions of certain congressional investigations. In fact, he is reported to have issued a confidential directive prohibiting any employe of the agency from giving as much as the time of day to any House or Senate staff member unless the inquiry is in writing and the answer is approved by a lawyer from the Interior Solicitor's department.

• Copper Deliveries Are Postponed

The Office of Defense Mobilization has authorized the postponement of all copper deliveries due under government contracts during the first quarter of 1956. The amount is estimated at 14,000 tons.

In a similar action, ODM authorized the diversion to industry of about 4,100,000 pounds of nickel a month, from scheduled shipments to the government, during the first quarter of 1956. None of the materials involved is to be released from the national stockpile.

• What Next?

Secretary of the Interior McKay seems to get himself in hot water with unusual frequency. His latest "boo-boo" is to open up the wildlife refuges for oil drilling.

Most of the land in these refuges was purchased by subscription by the various conservation associations and given to the government. Furthermore, any politician knows better than to cross the Society for the Preservation of the Whooping Crane, or similar organizations. The "fury of a woman scorned" is nothing compared to the storms the conservationists can whip up.

To make a bad matter worse, the first lease was given at what is described as an unusually nominal figure per acre to a subsidiary of Seagrams, the well-known whiskey distillers; and, it turns out, was dated the day before the date of the Executive Order throwing the preserves open. Someone's slip is showing!

• Straws In The Cold Wind

Interesting trends are being noticed in the government's attitude toward hoarders of gold coins and it now is understood that holders of illegal amounts of such coins will not be prosecuted. This does not mean that the Treasury will in the near future give its blessing to legislation similar to the Engle bill which would create a free market in

Continued on page 68

In California . . . And the World Over
Bucyrus-Erie Shovels
Move Big Tonnages Year After Year

In a western iron mine this Bucyrus-Erie 6-yd. 150-B shovel moves 1,000 tons of overburden and iron ore every hour . . . and is doing it month after month. It is this kind of consistent performance, year in and year out, that makes experienced mine operators turn again and again to Bucyrus-Erie machines.

Bucyrus-Erie quarry and mining machines feature the most advanced design in the field. Unique front end eliminates excess weight, provides plenty of strength. Ward Leonard variable voltage control and simple main machinery layout are among the advantages that result in high-efficiency performance.

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1. Valuable reference for reagent researchers is a Molecular Formula Index of over 32,000 compounds that have been synthesized or tested by Cyanamid. This vast compilation of basic data gives our reagent researchers access to the findings of all Cyanamid research in every chemical field.

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6. New cyanidation techniques are investigated with testing carried out in bottles on rotating rolls to simulate the agitation of pulp in a cyanide plant.

7. Facilities are available for gold and silver determinations by fire assaying, together with the most modern methods and equipment for conducting chemical analyses.

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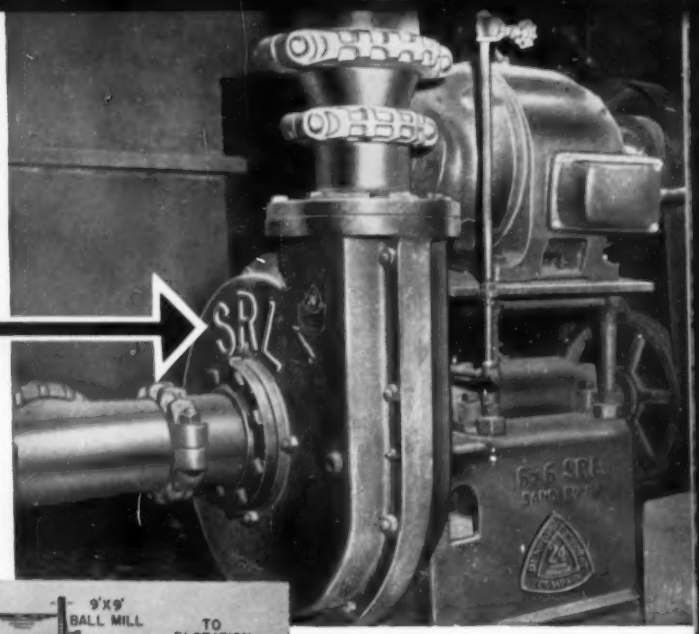
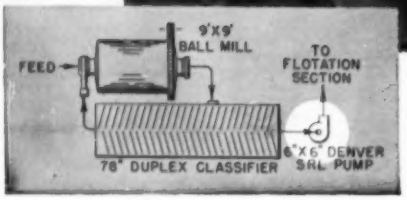
CYANAMID

DENVER SRL PUMPS AT Climax



Here's why Climax Molybdenum Company has 44 Denver SRL Sand Pumps in it's modern, efficient mill



A 6"x6" Denver SRL Sand Pump operating at 690 r.p.m., handling 2200 tons per 24 hours of —28 mesh classifier overflow material at 45% solids. Life of pump runner and casing liner was 593,000 tons.

BACKGROUND

Originally, a 2"x2" Denver SRL (Rubber Lined) Sand Pump was installed on a trial basis at Climax to handle coarse, abrasive —28 mesh deslimed pyrite flotation concentrates. Later, Climax purchased one 6"x6" Denver SRL Pump to handle the problem described with the photo above.

RESULT

Operation of these original Denver SRL pumps was so successful that, as a direct result, 42 additional Denver SRL Sand Pumps have been installed in this outstanding mill. These new pumps vary in size from the 2"x2" SRL (Open Runner) to the 8"x6" SRL-C (Closed Runner).

REASON

The Climax operators have found the efficient, trouble-free operation of Denver SRL Pumps entirely satisfactory. Life of wearing parts is long and shut-down time minimized. Horsepower requirements have been low and high efficiencies have resulted. Obviously, the Denver SRL is a big success at Climax.

HOW DENVER SRL PUMPS CAN REDUCE YOUR PUMPING COSTS

Send full data to us today regarding your particular pumping problem. Experienced DECO engineers will evaluate your problem and will return correct and workable recommendations immediately. This will obligate you in no way.

We carry replacement parts for all sizes of Denver SRL Sand Pumps in our Denver stocks. This enables us to give you prompt service whenever you may need it.

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Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

February 1956

INTERNATIONAL PANORAMA

SEOUL, KOREA—The Korean Tungsten Mining Company has contracted with the Utah Construction Company for the erection of a "synthetic scheelite" plant at the Sang Dong mine. Utah will also supervise plant operations.

WASHINGTON, D. C.—The Office of Defense Mobilization has postponed all copper deliveries due under contract to the federal government during the first quarter of 1956 (about 14,000 tons). All scheduled nickel shipments (about 4,100,000 pounds per month) have also been diverted.

ROME, ITALY—The National Sulphur Agency is shipping 50,000 tons of Sicilian sulphur to the Soviet Union.

GRAND JUNCTION, COLORADO—The United States Atomic Energy Commission has announced a policy of competitive bidding for leasing Colorado Plateau uranium deposits developed by AEC on lands controlled by AEC. Negotiated leasing has been practiced to date.

CLEVELAND, OHIO—Iron ore prices for 1956 delivery from Minnesota, and Michigan mines have been advanced an average of 8.0 percent. Mesabi Range, non-Bessemer set price pattern with a raise from $10.10 to $10.95 per gross ton.

TELLURIDE, COLORADO—Telluride Mines, Inc. has started production at its rebuilt and enlarged (1,400-ton) differential flotation mill here. Gold-silver-lead-zinc-copper ore from the Ajax vein is being milled.

SAN FRANCISCO, CALIFORNIA—Sulphur production in the United States in 1955 reached an all-time annual high of 5,700,000 tons.

GRANTS, NEW MEXICO—The American Metal Company, Ltd. is negotiating a contract with Sabre Uranium Corporation and Pinon Uranium Company for management of uranium mining operations on the two firms' claims, and for operating a mill when an AEC contract has been negotiated.

LANDER, WYOMING—States Mines, Inc. has sold 72 uranium claims in the Pumpkin Buttes area to the Philipps Petroleum Company. The claims have been partially explored by drilling to indicate an ore body. Philipps will step up exploration activity.

NEWCASTLE, NEW BRUNSWICK—Kennecott Copper Corporation's Canadian subsidiary, Kennco Explorations (Canada) Ltd., has discovered lead-zinc mineralization by geophysical methods on its large (400) group of claims. Diamond drilling is underway to check significance of discovery.

MANILA, PHILIPPINES—Lepanto Consolidated Mining Company plans immediate exploration of a tungsten deposit in the Philippines. This will be the first major tungsten exploration project in the Islands.

BRUSSELS, BELGIUM—The Brussels gold market has reopened following suspension of trading since before World War II. The government legalized import, export, or right to hold gold in bars, coins, and all other forms.

SUDBURY, ONTARIO—Nickel production reached an all-time peak of 427,000,000 pounds in 1955. Canada continued as the world's largest producer with 347,000,000 pounds. Cuba was second and New Caledonia third in output.

COSTERMANVILLE, BELGIAN CONGO—A new lead mining company has been formed to explore and develop lead deposits known to exist on the claims of the three companies—National Committee of Kivu, Great Lakes Mining Company, and General Minerals Company—which have formed the new company.

Sipalay Builds 4,000-ton Philippine Copper Mill

Sipalay Copper Mining Company, through Marinduque Iron Mines Agents, Inc. operating agents, has started construction of its 4,000-ton-per-day copper flotation mill at Sipalay, Negros Occidental, central Philippine Islands. Four bulldozers have cleared and graded the mill site, while pouring of concrete mill foundations has started. A stripping contract for 800,000 cubic yards of overburden has been awarded as the first phase in developing the open-pit mine for production. A dependable supply of fresh water for the mill has been developed from an underground stream only a few kilometers away.

A Diesel electric plant will be built to supply power. Studies are being made to indicate if the construction of an oversea aerial tram line from shore to cargo ships lying offshore will be feasible for concentrate loading. Erection and maintenance of a loading wharf would be a difficult problem because of the exposed shore and the prevailing winds.

Bids for the crushing plant equipment, Diesel electric plant, and the most important components of the mill have been requested from United States firms.

Liquid Metal as Fuel for Reactors May Be Feasible

Liquid metal as a fuel for atomic reactors appears technically feasible in the near future, and gives promise of becoming economically attractive, according to a study group headed by Babcock & Wilcox Company. The group was organized to explore the Liquid Metal Fuel Reactor (LMFR) system developed at the Atomic Energy Commission's Brookhaven National Laboratory in Upton, New York.

It was estimated that a full-scale plant with an electrical capacity of 226,000 kilowatts could be built and operated for a cost of 7.1 mills per kilowatt-hour. This price is lower than those for large conventional fuel plants in areas of the United States where fuel costs are high.

The LMFR system is capable of generating electric power, producing new fuel for itself, and delivering by-products to waste tanks, all in a continuous process. The fuel would be in a liquid form, for instance a liquid alloy of uranium and bismuth. The chief advantage of a reactor of this type is its flexibility. It can function as a regenerative or as a non-regenerative reactor; in either case, it could operate over a wide power range.

What is needed now is more research and development on the materials which will be used in construction and on the nuclear stability of the reactor. The group of 14 industrialists and 3 other organizations, supervised by Babcock & Wilcox, believes that investigation of these points should go forward without interruption.

KEY MEN looking over the stripping project are (left to right) Ray Sullivan, Blair Burwell, Robert Pruess, Joseph Gidwitz, and Gerald Gidwitz.

The Trend To U_3O_8 Open Pitting

The stripping ratio at Continental Uranium's Rattlesnake Mine May be a bulky 30 to 1, but open pit means more profit

By STANLEY H. DAYTON
Associate Editor

Certainly one of the most important mine developments taking place on the Colorado Plateau is at Continental Uranium, Incorporated's Deep North Rattlesnake ore body in San Juan County, Utah. A huge stripping program is underway at the deposit; 2,500,000 yards of overburden will be removed by big equipment to recover a 75,000-ton plus reserve of uranium ore. The real significance of this project is that these figures add up to a record shattering strip ratio of 30 to 1.

At first glance this figure may seem fantastic, but when all factors are considered, the open pit-versus-underground approach to the mining problem boils down to one of plain mining economics. Open pitting will yield a better recovery of ore. Continental expects to net $300,000 more than could be obtained by incomplete underground extraction. There is little question that the methods now employed by Continental at the Rattlesnake represent an entirely new and important application of earth moving machines to uranium mining, one worth a great deal of attention. Anaconda is stripping the multi-million-ton Jackpile in New Mexico, but the Rattlesnake consists of a series of typical small deposits found in the Morrison formation.

This is what is involved in the project. Daniels Construction Company will remove 2,500,000 yards of the Brushy Basin member of the Morrison formation, under contract, to expose the Salt Wash member. Selective open-pit mining will then be employed to recover ore which is concentrated in a relatively small, trapizoidal-shaped area measuring approximately 450 feet long by 300 feet wide.

Fringe Ore Exposed

In addition, with this huge amount of overburden scraped away, underground mining methods can be applied to several isolated ore occurrences around the fringe of the open pit. Mining depths would be far too great to make the recovery of these fringe zones economical, but openings collared from the bottom of the pit can be used to develop this ore.

Another factor which could be taken into consideration is that open pitting might possibly create a windfall by adding to those ore reserves now calculated from drill hole results. A characteristic of uranium deposition in the Morrison formation is that sporadic, small, high-grade logs or pods often occur. The possibility of overlooking these sources of uranium ore is quite high in an underground operation. With the application of surface mining methods, Continental hopes to increase the chance of locating these hidden deposits.

Background & Geology

The ground was originally staked by Westwood and Oliver of Moab, Utah. Later, the Old Texas Mining Company obtained a lease on the showings at the Rattlesnake, did some drilling and a little mining to the south of the area now being stripped. Woodmont, Incorporated, a wholly owned subsidiary of

THE TREND TO OPEN PIT MINING is exemplified by Continental Uranium's stripping program where 2,500,000 yards of overburden will be removed to recover 75,000 tons of ore. In the foreground, a Bucyrus Erie shovel takes a bite of shale while a Northwest shovel works at the rib shown in the background. Euclid trucks are used for haulage.

Continental Uranium, acquired the Rattlesnake holdings and instituted a drilling program.

The deposit was drilled on a grid pattern with holes spaced on centers varying from 50 to 500 feet and even up to 1,000 feet in some cases. The drilling, contracted largely by Minerals Engineering Company of Grand Junction, Colorado, disclosed two major ore zones in the area now being stripped. Where ore was encountered in a drill hole, usually offset holes were put down to check the results. Ore reserve calculations were based mainly on the results obtained by core drilling rather than by what was disclosed by rotary drilling. It was felt that core drilling furnished much more reliable data on which to base estimates.

Ore in Morrison

The ore was found in the Salt Wash Member of the Morrison formation 25 to 40 feet below the contact with the upper Brushy Basin member. As is so typical of previous deposits found in the Morrison, the ore occurs in a number of small discontinuous deposits. This is one reason why offset drill holes were necessary to check mineralization. A project of the magnitude of the Rattlesnake stripping operation, of necessity, had to be based on reliable data.

The two major ore bodies are larger than the average size usually mined in the Morrison. Uranium is found principally in secondary minerals of which carnotite is the most important; the mineralization follows the general trend of the bedding. A line connecting the center of the two deposits would trend north-west-southeast. The thickness varies anywhere from 6 inches up to 33 feet; however, a rough general average would be 4 to 5 feet. Severe post ore faulting is much in evidence and often displaces the ore. A total of 75,000 tons plus of uranium ore has been delineated in the Deep North area now being stripped.

About 20 miles to the southeast Continental Uranium is producing and shipping ore from the underground Continental Number One mine.

Pilot Zone

The thought of stripping and open pit mining of the Deep North ore body didn't occur without considerable advance planning; in fact, a small area just to the south of the zone now being stripped was ideally situated for a pilot study of stripping. This was the site of the original workings of the Old Texas Mining Company, which had driven an incline and had done some stoping. There were three small pods of uranium ore deposited in this area at various elevations in the Salt Wash member of the Morrison formation. When Continental Uranium acquired the Rattlesnake holdings, much of the Old Texas workings had caved, and the openings were considered un-

Officers and Staff
Continental Uranium, Incorporated

Gerald S. Gidwitz	Board Chairman
Ray Sullivan	Vice President
Robert Pruess	Manager
Herb Reynolds	Superintendent

BOTTOM DUMPING 20-yard scraper hauled by Cat D-8 discharges a load at the east dump. Bulldozers level and keep moving this rock over the edge. Trucks transport overburden to the opposite side of the pit for coordination of haulage cycles.

suitable for maximum recovery of the ore lying in the small lenses. It was felt that surface stripping was the only answer to economic recovery of this ore.

Stripping was started at the small pit in the summer of 1954, and the mine was producing ore by September 1954. The operation, contracted by Minerals Engineering Company, was finished at the end of September 1955.

Gardner-Denver jackhammers and airlegs were used to drill blast holes. Broken ore was moved to a dump with an Allis Chalmers HD-5 front end loader and later with a Koehring Dumptor. Selective mining was practiced with ore and waste blasted separately. Extensive test holes were drilled during actual mining to locate logs or other unknown areas of shipping grade ore.

Birth of an Idea

The pilot pit was stripped of 50,000 cubic yards of waste to recover what was originally estimated to be 3,000 tons of uranium ore. Actually, Continental was able to recover over three times that amount of ore from this deposit. The data gathered during this operation furnished a reliable basis on which to predict the costs of stripping and mining the larger Deep North ore. Comparative cost estimates were drawn up for open-pit mining as opposed to underground extraction. A decision was made to proceed with plans for surface mining. The choice was based on these factors:

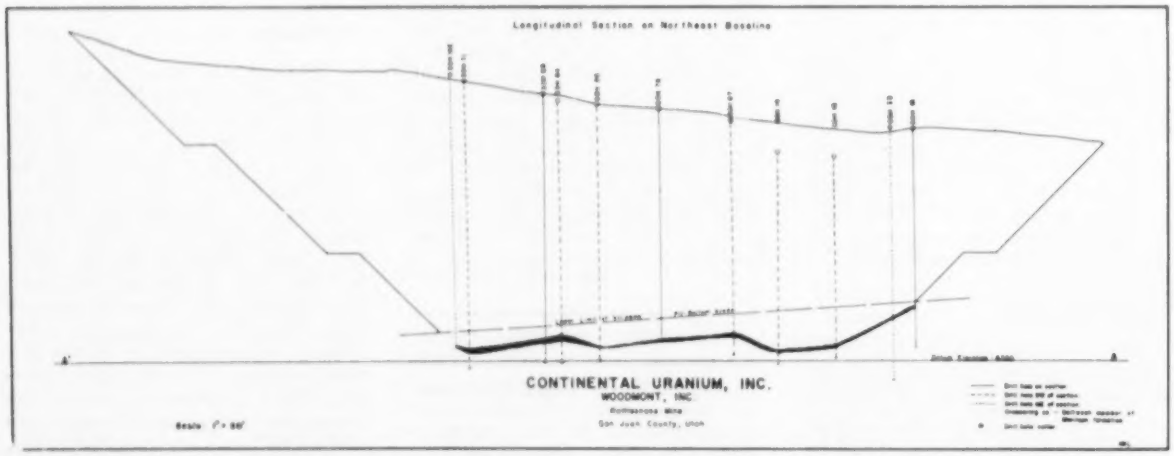
1. Drill hole data and general studies showed that the Deep North deposits were overlain by loosely consolidated siltstones and mudstones of the Brushy Basin member. This meant little drilling and blasting and cheap stripping costs.
2. Ores of good thickness were concentrated in a relatively small area at the Deep North deposits.
3. Post ore faulting resulted in displacement of lenses which would complicate underground mining.
4. Better overall ore recovery was expected by open pitting, since there would be no pillar loss or thin seams remaining, which would be impossible to reclaim by underground mining. It was estimated that only 75-85 percent could be extracted by underground mining.
5. Small deposits surrounding the stripped area would be made accessible.

Rippers and Scrapers

Daniels Construction Company received the stripping contract which calls for the removal of 2,500,000 yards of overburden. For the most part the overburden can be handled with rippers and scrapers. Daniels Construction moved in on the job June 20 and should finish the project sometime in the first quarter of 1956. With the completion of this contract the harder Salt Wash member of the Morrison formation will be exposed and preparations can be made for actual mining. The company expects to operate the mine itself.

The equipment which Daniels Construction is using is:

Three Caterpillar Tractor Company DW-15 units, each hauling Number 15 scrapers with a load capacity of 16½ tons; two Caterpillar D8's pulling No. 1080 scrapers (20-yard capacity); one



POSITION OF ORE, lower stripping limit and surface is shown on section taken along A-A' line of map on next page.

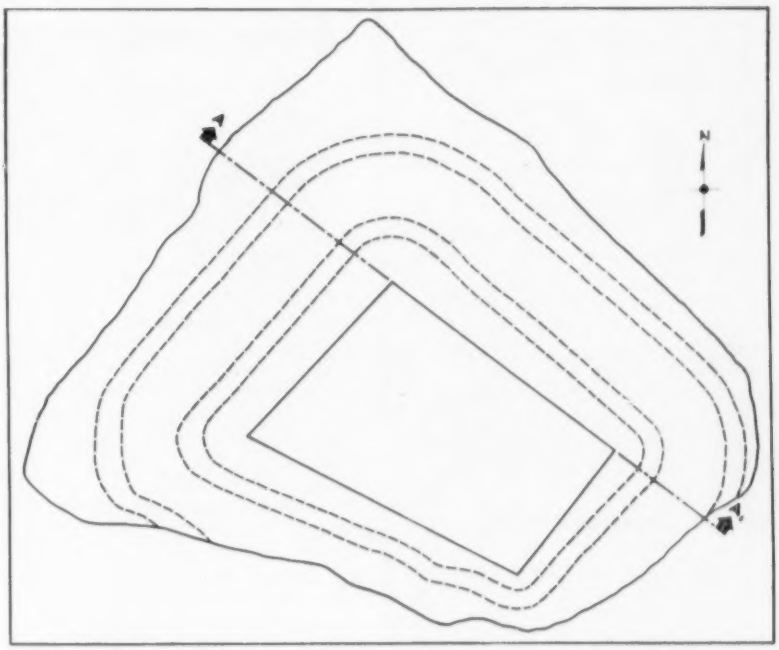
Bucyrus Erie 38-B shovel with 1½-yard dipper; one Northwest 80-D shovel with a 2½-yard dipper; five Euclid trucks with 15-yard capacity; two bulldozers, one of which is an Allis Chalmers HD-21, the other a Caterpillar D-8; another Caterpillar D-8 with a ripper attachment which serves as a pusher for the rubber-tire mounted DW-15-scraper units; and a No. 12 Caterpillar road patrol.

100-Foot Safety Benches

The overburden is being removed at an approximate rate of 10,000 cubic yards per shift. At the end of September between 900,000 and 1,000,000 yards had been stripped. The pit is going down on a 1 to 1 slope and safety benches will be established on 100-foot levels; these will be 30 feet wide. If this height proves too great to control the slough hazard, bench levels will be reduced to 50 feet with 15-foot widths.

The high point on the periphery of the pit will be 310 feet above the bottom. At this point the northwesterly trending and northeasterly trending boundary of the mineable zone intersect. The depths at other corners of the trapezoidal shaped area are 145 feet, 95 feet, and 225 feet. The first safety bench will be located 130 feet below the high corner.

When stripping first began waste dumps were spotted at opposite ends of the pit, one in the vicinity of the corner which will reach a 225-foot depth, the other on the up-slope side of the corner which will reach a 145-foot depth. As stripping progresses, new dumps of necessity will have to be located and the waste will probably be hauled out to the south where the surface topography flattens and the depth to the ore decreases to 95 feet. All existing and proposed dump locations have been planned so that the maximum haulage distance is no greater than 800 feet.



WHAT WILL BE DONE at Deep North Rattlesnake is shown in plan. Center trapezoid is area at bottom to be stripped and measures 450 by 300 feet. Outer line is pit periphery and dotted lines mark location of safety benches on 100-foot levels.

The three Cat DW-15 scraper units work in a cycle aided by the D-8. The more powerful track-mounted Cat D-8's hauling 20-yard scrapers can operate without a pusher; however, the speed at which the loaded smaller rubber-tire units work is impressive.

Shovels and Trucks

The two shovels and Euclid trucks work together in harder sections of the pit. For instance, in one area, apparently some time in the geological past, a large mass of overlying Dakota formation rock (composed largely of gray sandstone) either sloughed-in or was displaced by faulting to intrude the surrounding Brushy Basin member. The end result was to create a hard, rock-like rib extending through the upper part of the area marked for stripping. The rib-like mass is not in place, but several of the large boulders must be blockholed, using hand held sinkers and powder before the rock can be loaded and hauled.

Two trucks work with the smaller Bucyrus Erie shovel, three with the 2½-yard Northwest shovel. The waste hauled by the trucks is unloaded at one dump, and the material removed by the tractor-drawn scraper units is released at the second dump. Since only two bulldozers are on hand, utilization of a separate dump for each type of haulage unit proves particularly advantageous. A tractor with blade attachment is required nearly full-time to push loads dropped by bottom-

HIGH SPEED Caterpillar DW-15 tractor, hauling a 15-yard scraper, is pushed by a Caterpillar D-8 with a ripper. Most of the cover is loose which leads to low stripping costs.

20-YARD SCRAPER hauled by Cat D-8 gathers a load at the Deep North Rattlesnake project. High point on pit periphery in background will ultimately be 310 feet above bottom.

dump scrapers over dump edges. The trucks, of course, can drop waste over the edge, so one bulldozer, generally the big HD-21, is released for full-time pioneering work.

The completion of the stripping project will bring the point of access much closer to a fringe ore body at the North edge of the pit. An estimated 25,000 tons has been drilled in this deposit, which can be developed by a 250-foot adit from bottom of pit.

When the Salt Wash member is reached (by April 1956) the pit will be below the level of the present campsite. Mining of the individual small leases and pods, using drills and loaders will be used to reach the ore which is some 25 to 40 feet below the Brushy Basin contact.

Uranium Reduction Plant

Plans for a small, compact uranium ore reduction plant reached a head late in November 1955 when Continental signed a contract with the Atomic Energy Commission providing for the purchase of all concentrates produced. It is expected that the company will process its own ore and will purchase substantial quantities from other uranium producers as well. The mill will be completed by July 1, 1956 and will cost approximately $1,250,000, to be amortized over a five-year period.

According to board chairman Gerald Gidwitz, the process to be used will recover the vanadium as well as the uranium content of the ore. Under the terms of the contract with the AEC, Continental retains ownership of the vanadium. Long term arrangements for the sale of the vanadium will be negotiated by the company.

The plant will be constructed on a 40-acre site near La Sal, Utah. The mill site is one of the few areas in the uranium mining district that has an available water supply. The location is about three miles from the Rattlesnake mine and 18 miles from Continental Number One.

Growth

Continental Uranium has made considerable progress toward building a new, well organized company. First properties were acquired in September 1954. For the four-month operating period in 1954, the company showed a profit of $91,606.51 after provision for federal income taxes but prior to deduction for depletion. In the first half of 1955 this figure rose to $175,393.16, a sizeable increase even in view of the longer operating period. Soon company will be deriving milling profit as well as mining profit.

How Montana Phosphate

Although phosphate rock is used in enormous tonnages in making fertilizers and chemicals, it has a relatively low market price per ton (from $3.95 to $7.00). This is why Montana Phosphate Products Company, which supplies phosphate rock to the fertilizer plants of The Consolidated Mining & Smelting Company of Canada Limited at Trail and Kimberley, British Columbia, is seeking more efficient methods of mining its deposits at Garrison, Montana. Part two of the $2,000,000 program will be a new 2-mile long haulage tunnel on the 4600 level of the Anderson mine which will be modernized to cut costs. A 4.7-mile-long railroad line just completed will connect the portal of the tunnel with the main line of the Northern Pacific. Heavy rail and Diesel haulage will be used to speed the ore handling problem when the installation is completed. Completion of the haulage adit will make it possible to bypass the shaft hoisting operation and result in overall increased efficiency.

Current underground production comes from two mines—the Anderson and the Gravely. Another mine, the Luke, is worked at intermittent intervals when additional production is needed. Since the ground at the Luke stands quite well over long periods of time, it is a relatively easy task to re-enter the Luke to make up output as required. Production at the Anderson amounts to 800 tons per day, which is hoisted through a 17- by 7-foot shaft (outside dimensions). Over 380 tons of ore per day are trammed from the Gravely mine located nearly seven airline miles east of the Anderson. The topography of the region is quite rugged and it is necessary to use short connecting roads from major highways in order to gain access to the Anderson and the Gravely. This means that supervisors must travel nearly 30 miles to get from one property to the other.

Three Mines on Different Folds

As explained in a preceding article (See MINING WORLD page 44, November 1955. the ore occurs in a single bed 3½ to 5 feet thick, which is a member of the Phosphoria formation. The formations have been warped and folded to form a series of anticlines and synclines with axis showing a northwesterly trend. The Anderson mine is located on the southwestern flank of the Garrison anticline. The Luke and the Gimlet, the latter a new prospect, lay to the east of the Anderson on the opposite limb of the Garrison anticline. The Gravely is some three miles east of the Luke and occurs on a synclinal structure. The general dip of the folds is gentle, usually varying from 22° to 30°. In the Garrison anticline this dip becomes slightly flatter towards the crest and steepens with depth. Just the opposite condition has been noted in the structure at the Gravely. As mining went deeper, the dip flattened, but stopes in the upper workings are nearly vertical.

Mining conditions vary somewhat between the two main workings, the Anderson and the Gravely; therefore, each mine will be described separately.

At the Anderson mine, a three-compartment shaft 7 by 17 feet in cross section was collared on the 5200 level. This shaft has been sunk a distance of 975 feet below the surface and bottoms just below the 4300 level. Present mine workings are established on the 5200, the 4800, 4600, and 4450 levels. The 5200 furnishes only limited production which is trammed to the surface through an adit. The lowest level, the 4300, is in the process of draining and no development work will be undertaken at this elevation until later in the year.

Room and Pillar Mining

The general system of mining is room and pillar, advancing a 60- to 70-foot stope face up an approximate 25° incline to the next level. The levels were planned and laid out to provide approximately 300 feet of stoping distance along the slope of the phosphate bed.

Development of each level usually follows a similar pattern. Crosscuts from the shaft station are driven northeasterly to intersect the ore body. Drifts are then driven keeping the back in ore and taking up enough bottom to provide an 8- by 9-foot cross section where untimbered or a 10- by 9-foot heading where timber must be used. Drifts are drilled with jumbos or with air legs and the muck handled with Eimco 21 or Gardner Denver No. 9 loaders.

Stoping Blocks 72 Feet Wide

Chute cut outs are made at 72-foot intervals along the drift, and a raise, two compartments wide, is carried up 25 to 30 feet in the ore. Double chutes 3 feet wide at the lip are then installed and the ground, starting just above the

Cuts Cost

chute, is gradually winged out by slashing the raise to make a 60-foot-wide face along the strike of the orebody. This forms a V with the apex at the chutes and the face widening to 60 feet at the back of the development raise. Individual stopes are 60 feet wide with a 12-foot pillar between stopes. The pillar is broken through at 20-foot intervals for ventilation purposes as the stope advances up the slope.

Strong Hanging Wall

The hanging wall is quite competent but some form of support was needed over the wide stoping area. The dip of the phosphate bed was too flat to permit shrinkage stoping since the ore would not run at the 25° to 30° dip of the phosphate bed. Consequently, the present system of mining evolved, using slushers to scrape ore to the chutes and stulls for temporary support during the life of the stope. Three rows of stulls, 15 feet apart, are carried up the stope. The spacing between stulls in an individual row is 5 feet.

The entire 60-foot-wide face is drilled and blasted to provide muck for the slusher in one operation. Generally, 60 to 70 holes are used in breaking the round. A rough rule of thumb used is approximately one hole per foot of stope width. The holes in the face are placed in a zig zag fashion with the back holes 20 inches or so below the hanging wall. The usual stope round is drilled 6½ feet deep with stopers or air legs.

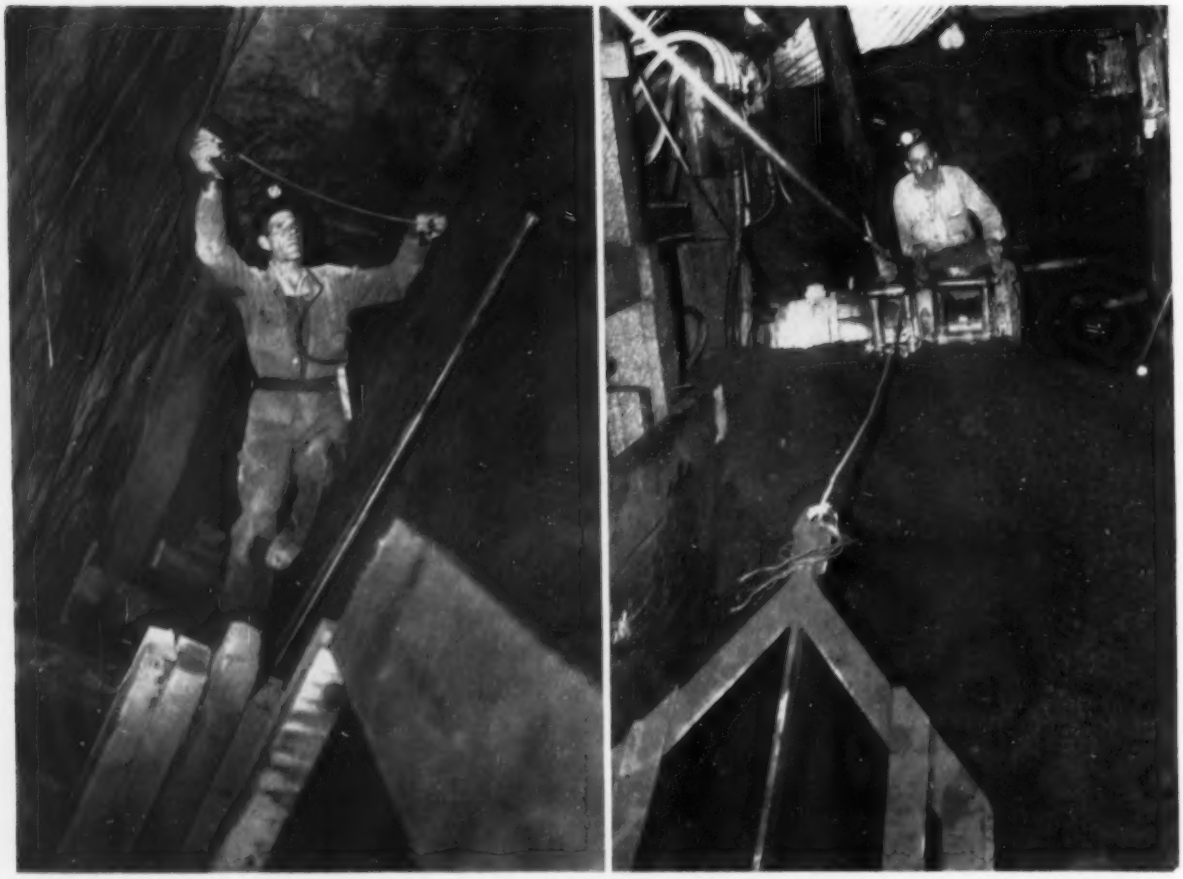
Ordinarily, there are three men working a stope on contract. One man does the drilling, the second operates the slusher, and the third moves the haul back block and helps the miner who is drilling.

Level Interval 300 Feet

Using the system just described, the stope advances up the slope to the next level, about 300 feet. For ventilation purposes, every other stope actually holes the next higher level. Mined out stopes provide waste disposal areas for waste rock handled on the next higher level.

Both electric and air-powered slushers are used, although the trend is to

A DAY'S WORK for miner James Monroe is drilling this 50-foot long stope at the Gravely mine with 6-foot holes.



MEASURING A STOPE to determine contractors' pay is mine foreman Les Brander at left. Like the Anderson mine, stulls are used for hanging wall support, but ore flows to chutes by gravity, and each round is drawn off daily leaving an open stope. At the right, mine foreman Ken Wood of the Anderson mine sits at slusher located at shaft pocket.

more electric installations. The hoists rated at 15 and 20 horsepower are made by Gardner Denver, Joy Manufacturing Company, and Ingersoll-Rand.

Box scrapers 4 and 5 feet wide are used; the larger ones have a capacity of 10 cubic feet. One of the most interesting aspects is the general high level of proficiency of the slusher operators. Working in a stope so big that the scraper can't be seen by the operator 75 percent of the time, he develops a delicate sense of feel for the operating conditions. Even when the scraper is out of sight he knows when to tightline the rope, how to avoid hanging up on one of the numerous stulls, or whether to stop to right an upset scraper.

Longwalling Tried

In some areas of the mine a departure from the standard room and pillar method is necessary to properly control hanging wall conditions. Some experimentation with panel or longwalling is being done. A similar chute spacing is used but a raise consisting of a chute and manway is driven all the way to the next level instead of being stopped at 25 or 30 feet above the drift. From the side of the development raise, 12-foot-wide panels, extending from the top to the bottom of the stope, are mined along the stoping block to the next raise. The ground is allowed to cave behind the men as the panels advance along the strike to the next stope. With this method, the hanging wall of the stope is left in better shape following a blast, and safer working conditions prevail. Slushers are similarly used to remove the muck, the only difference being that no attempt is made to hold more than one 12-foot panel open.

Muck scraped to the chutes is loaded in 33-cubic-foot, Coeur d'Alene, side dump cars and trammed to the shaft station in six- to 10-car trains where a unique method for handling ore at the shaft has been devised.

Use Slusher Pockets

Instead of a conventional shaft pocket which either loads the skip directly or loads a measuring pocket, Montana Phosphate uses a slusher pocket. The slusher pocket is an excavation at one side of the track and parallel to the rail at the shaft station. It measures 75 feet along the track, bottoms at 11 feet below the level of the rails, and is approximately 10 feet wide. A measuring pocket or raise connects the floor of the slusher pocket with the shaft. The bottom of the slusher pocket is lined with rails and a grizzly is placed over the measuring pocket. The loaded cars in each train can all be dumped without bothering to move the train. A slusher installation scrapes the ore in the slusher pocket to the measuring pocket which is equipped with air-operated gates. The shaft bells and valves controlling the gates on the measuring pocket are placed within easy reach of the slusher operator. He is then able to load the skips and ring them away without leaving the hoist. On some levels two slusher pockets have been installed—one for ore and one for waste. The chief advantage of this system is that one man is eliminated since ordinarily a man must be present at the grizzly and a skip tender at the loading pocket in conventional installations. In addition, trains need not be spotted while each car is dumped, since the slusher

pocket is long enough to accommodate an entire train length.

Levels Must Be Dewatered

The natural water table at the Anderson mine occurs at about the 4,850-foot elevation. Three levels are below this horizon, and planning for new underground production must be closely synchronized with existing activities at the mine. A level opened for mining should be nearly water free in the areas outlined for stoping. Primary reason for this is that the phosphate rock breaks quite fine. The freshly broken muck will form a slurry which would be very difficult to handle and hoist if excess water is present. The chert hanging wall is porous, containing occasional vugs and channels, and a similar condition holds true in the Phosphoria formation. New levels are drained for nearly a year before any attempt is made to mine. Essentially, the problem is one of tapping the cone of influence as the shaft is extended to a lower elevation. This is done by driving a short crosscut to within 20 feet of the ore body whenever a new shaft station is cut. From the face of the crosscut several drill holes can be bored to the phosphate bed. The holes are capped to control the quantity of water draining to the sump. The normal inflow to mine workings ranges from 400 to 500 gallons per minute. The ground water on the 4300 level of the Anderson mine is at present draining through five holes which were drilled into the ore body from the 4300 crosscut. This quantity is handled by a 200-horsepower Layne and Bowlor deep well pump and a 150-horsepower CNT 4 Ingersoll Rand pump from sumps below the 4300 level. The auxiliary 75-horsepower centrifugal pumps which remove the water in two lifts, from the 4300 to the 4800 levels and from the 4800 to the surface, serve as standbys.

Ore is hoisted up the three-compartment shaft, located well in the hanging wall of the flat dipping deposit, in 2½-ton skips, which dump into a 400-ton surface bin constructed of timbers. At the present time a local contractor hauls the phosphate rock from the surface bin 3 miles to a loading terminal located on a Northern Pacific rail siding. With the completion of the new haulage tunnel in the next two years, all production from the mine will be transported by 60-ton railroad cars from the portal to the railroad line located in the valley.

Steeper Dips at Gravely

Conditions at the Gravely mine differ somewhat from those which prevail at the Anderson mine. The ore, in general, is harder due to the occurrence of recrystallized quartz at the grain boundaries of the phosphate oolites. The dips of the beds located on the synclinal structure are nearly vertical in the upper workings, but gradually flatten to 40° at the lower 4900 level, located approximately 400 feet below the 5300 main haulage adit.

Mining at the Gravely underwent an evolution similar to the Anderson. In the steeper portions of the deposit, shrinkage stopes were tried but the fine ore wouldn't run, even at nearly vertical slopes. A modified shrinkage stoping system with ore chutes and a manway placed in the center of a stoping block was tested with little success. Using this method, just enough ore was slushed to the chutes to provide working room for cuts taken along the back of the stope. When a stope was finished, the broken ore was removed by slushing to the raise rather than by a gravity draw method. The inherent nature and physical characteristics of the phosphate rock doomed this system since the fine ore underwent an extreme packing effect during its storage in the stope. The stoping method now in use—open stopes with stull support for the hanging wall—has proved very successful.

Winze Opens Lower Levels

The phosphate bed shows the same general thickness in the Gravely mine —5 to 5 feet. The topography of the terrain made it possible to develop the mine through a series of adits above the 5300 level (which is now the entrance through which the entire 380-

TO CUT COSTS the present shaft hoisting operation at the Anderson mine will be by-passed when the new low level haulage adit is completed. The headframe over the 975-foot shaft is 95 feet high, and the bin has a capacity of 400 tons.

ton-per-day production is removed from the mine).

Two levels below the 5300 were developed by sinking a winze in the ore which measures 14 feet by the width of the phosphate bed. The winze followed the dip of the bed which flattened to 40° near the lowest level. The ore is hoisted in a 30-cubic-foot bucket which is dumped into a bin just above the 5300 adit. Rubber rollers were installed on both the footwall and the hanging wall of the winze to prevent rope abrasion.

Small Pilot Headings

At the Gravely mine development drifts are driven in a different manner. Initial small headings are confined to the footwall keeping the back in contact with ore. After sufficient headway is gained with the pilot drift the ore in the back is slashed down to make a drift 8 by 9 feet in section.

Access to the stopes is provided by double chute cutouts, with a manway placed between the chute compartments, spaced every 50 feet along the development drift. Ore is broken by overhand stoping using 6-foot up holes drilled with stopers. The miner will drill the entire 50-foot back along the stope, but blast only a 25-foot section each day. Eight-inch stulls are used to support the hanging wall and are spaced at 4-foot centers along the strike of the deposit. Distance between the stull floors is six feet. Broken ore is drawn from each stope daily to prevent packing and hangups. The general practice is to leave a 15-foot pillar along the bottom of the stope and occasional pillars in the stope if the ground gets too heavy. The rounds are blasted using igniter cord and fuse.

PUTTING THE FINISHING TOUCH on a timber set at the face of a drift in the Anderson mine is Francis Gilman. Timbered drifts are 10-by 9 feet in cross section. The top and bottom of the phosphate bed is well marked by clay seams.

HOW A SLUSHER POCKET at a shaft station looks from the track level at the Anderson mine. The pocket is 75 feet long, about 11 feet deep and measures 10 feet wide. One man scrapes ore to the measuring chute, loads the skips and rings them away.

Water Table Below 4,900

Most of the production at the Gravely mine is now coming from the winze levels and extensions of the 5300 level. Limited production is obtained from the areas in workings above the 5300 level which is dropped through an ore pass to the haulage level. Trains made up of 33-cubic-foot Coeur d'Alene cars tram the rock to a 400-ton surface bin located at the portal of the 5300 level. The phosphate is hauled in 20-ton trucks to a loading platform located at Avon, Montana adjacent to the Northern Pacific railroad.

The water table at the Gravely occurs at the 4900-foot elevation which is just below the present 4900 level, the lowest mine working. Therefore, no pumping is required now. The winze extends 120 feet below this level, and an extremely large quantity of water has been encountered at the bottom of the shaft, which will pose a problem if deeper levels are to be developed. Inflow at this point amounted to over 1,350 gallons per minute.

In addition to the normal production from the Anderson and Gravely, the Luke mine is worked intermittently, probably on the order of once a year for a short period of time. The ground at the Luke stands open for long periods of time, and the mine furnishes an excellent safety valve for needed production.

Gimlet

In the spring of 1952 work started on a new prospect, the Gimlet, located two miles northwest of the Luke. The surface installation is located at an elevation of 6,100 feet, and the work to date has primarily been of an exploratory nature. A total of 4,600 feet of drifting has been accomplished and three raises which measure 20 feet by the width of the ore have been driven about 100 feet above the level to test the back and explore the formation. It is possible that future production from this prospect will reach 500 tons per day.

MINING WORLD is indebted to the staff of Montana Phosphate Products Company for the fine cooperation in furnishing data concerning their operations.

LITHIUM CORPORATION OF AMERICA'S new lithium chemicals plant at Bessemer City, North Carolina. Spodumene from company mines is converted into lithium carbonate and lithium hydroxide for ceramics and multi-purpose greases.

How Lithium Corporation Converts Spodumene To Lithium Chemicals

Lithium use has had a spectacular growth since the end of World War II. Greatest demand for lithium is in the hydroxide form as a basic compound in the manufacture of multi-purpose greases used for wide temperature variant applications, and as the carbonate for ceramic uses.

With lithium chemical demand increasing, the Lithium Corporation of America, Inc. decided to concentrate on mining of spodumene as a source of lithium. One of the best known areas in the United States containing spodumene is the pegmatite "tin-spodumene belt," about 25 miles long and two miles wide, extending south from Lincolnton, North Carolina to Grover, South Carolina.

Lithium Corporation owns and leases many spodumene deposits in this belt and has outlined extensive reserves by diamond drilling. Two of the largest deposits now being mined are the Murphy-Houser, and Indian Creek. These two mines are operated as open pits with the crude ore trucked to the centrally located Bessemer City, North Carolina plant for processing.

Metallurgical History of Lithium

For many years lepidolite was the main source-mineral of lithium. Soluble lithium sulfates were formed by heating the mineral with concentrated sulphuric acid. Final recovery of the metal from this process involved complicated purification steps, thereby limiting its commercial application. This process, also, could not be used for spodumene.

The "base-exchange" process, developed early in the 1900's, was applicable to either spodumene or lepidolite. The ore was mixed with an excess of potassium sulphate and heated to cause an exchange of ions. The lithium ions were replaced by the potassium ions, and, when leached with water, formed a solution containing lithium sulphate. Commercial recovery of lithium from spodumene by this method was prohibited by the large quantity of reagents required.

In 1943 Lithium Corporation, then Metalloy Corporation, developed a new method for the recovery of lithium from spodumene ores. This method first changes spodumene from its naturally occurring alpha form to the beta form by heating to 1,050° to 1,100° C. Then the ores are treated with sulphuric acid under carefully controlled conditions of temperature and time effecting an exchange between the lithium ions and the hydrogen ions to form water-soluble lithium sulfate and a hydrous aluminum silicate.

Metalloy Corporation constructed a plant at St. Louis Park, near Minneapolis, Minnesota, utilizing its new process. Spodumene ores were supplied by its mines at Keystone, South Dakota. In 1947, Metalloy was merged into Lithium Corporation of America. Because of the success of the process, Lithium Corporation decided to concentrate on spodumene ores.

PART II

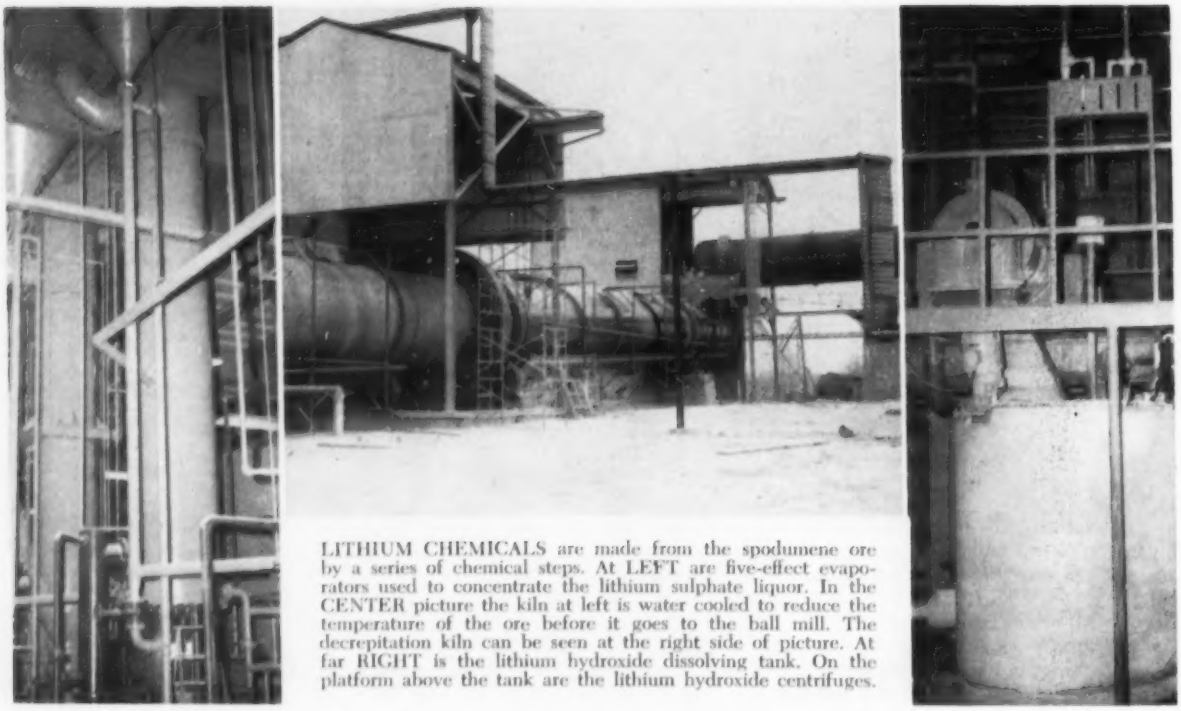
Lithium Metallurgy—Carbonate Plant

This is Part II of two articles on the North Carolina operations of Lithium Corporation of America, Inc.

The January 1956 issue of MINING WORLD described the history and uses of lithium. The geology of spodumene, and open-pit mining by the Lithium Corporation were also discussed.

Plant Is Centrally Located

As Lithium Corporation's holdings in the North Carolina tin-spodumene belt are quite dispersed, a centrally



LITHIUM CHEMICALS are made from the spodumene ore by a series of chemical steps. At LEFT are five-effect evaporators used to concentrate the lithium sulphate liquor. In the CENTER picture the kiln at left is water cooled to reduce the temperature of the ore before it goes to the ball mill. The decrepitation kiln can be seen at the right side of picture. At far RIGHT is the lithium hydroxide dissolving tank. On the platform above the tank are the lithium hydroxide centrifuges.

located site was chosen for the plant. It is located between Kings Mountain and Bessemer City—29 miles west of Charlotte, North Carolina.

Construction of the chemical plant was contracted to Southeastern Construction Company of Charlotte which completed the job in about 7 and a half months. The shakedown operation began in late January 1955.

Carbonate Is Basic Product

Lithium carbonate is the most important lithium compound produced at the new chemical plant. It has greater marketability and is No. 1 in sales volume. Its importance can be readily understood because it is used as the base to make all the other lithium compounds, as well as metallic lithium.

As mentioned earlier, the first step in processing spodumene is to change it to the beta form. Before this conversion the ores are reduced from run-of-mine to minus —¾-inch in two stages. Primary crusher is an A-C 18-by-30-inch jaw crusher set at 4 inches. An A-C Hydracone No. 636 crusher is set at three quarters of an inch for the final crushing stage.

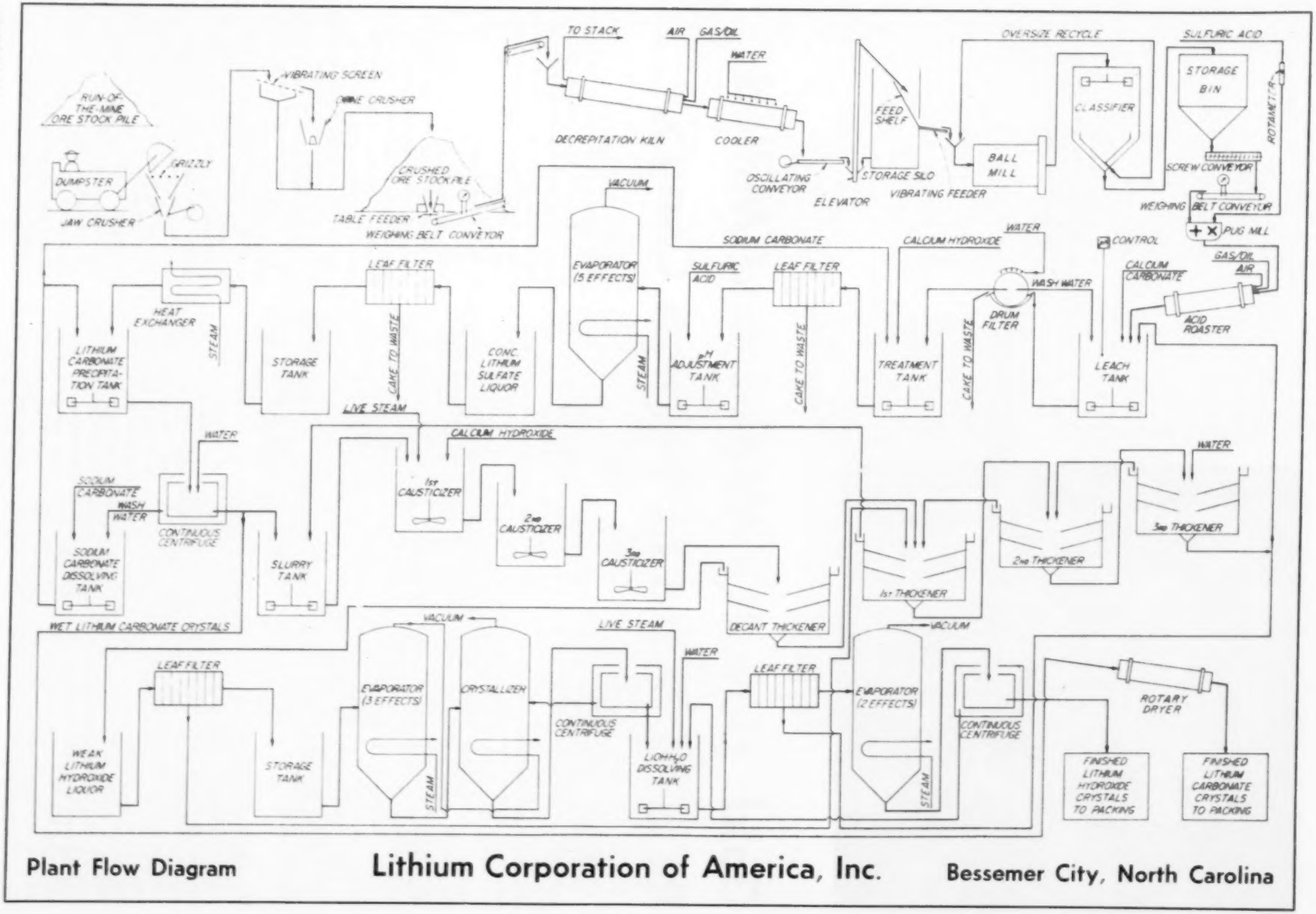
In the decrepitation kiln, the ore is heated to approximately 1,050° to 1,100° C., converting alpha spodumene to the beta form. Spodumene in the alpha form is hard and has a density of 3.15. In the beta form the ore is less dense (2.4) and is easily crushed to powder. The rotary A-C decrepitation kiln is gas-fired (oil stand-by) and measures 11 feet in diameter by 250 feet long.

Before going to the ball mill for fine crushing, the ore temperature is lowered to below 50° in an A-C, water-cooled, rotary kiln. The 10- by 15-foot A-C ball mill operates in closed circuit with a 16-foot-diameter Sturtevant air separator. All plus-100-mesh material returns to the ball mill. The minus material (40 percent between 100- and 200-mesh and 60 percent minus-200-mesh) goes to the pug mill (acid mixer).

In the pug mill, 66° Baume sulphuric acid is intimately blended with the ore. No chemical reaction occurs during the mixing. The acidified ore is fed to a rotary acid roasting kiln and re-

Continued on page 91

KEY LITHIUM METALLURGISTS are, from left, R. L. Nielsen, plant manager; J. D. Herman, chief chemical engineer; and Gerald Orazem, chemical engineer at the Lithium Corporation of America, Inc.'s Bessemer City North Carolina plant.



Plant Flow Diagram **Lithium Corporation of America, Inc.** **Bessemer City, North Carolina**

WHERE OPERATIONS of the Kilo Moto Company are centered is shown in white on this place-fix map of the Belgian Congo. Watsa and Kilo are about 300 kilometers apart.

Gold: How It's Mined and Milled By Kilo Moto In Belgian Congo

Gold mining in the northeastern section of the Belgian Congo has come a long way since shortly after the turn of the century when two widely separated placers were first discovered in the then isolated Lake Albert area near the Uganda border. From the simple alluvial deposits which were easily exploited, Societe des Mines d'Or de Kilo Moto next developed and mined the weathered vein cappings forming the source rock and finally the lodes at greater depths. As more complex ores were worked milling graduated from simple washing and amalgamation to modern cyanide plants.

The Social Factor

The Kilo Moto Gold Mine Company not only plays an important economic role in this region, but was and still is a dominant social and civilizing factor. The operating mines and metallurgical plants employ about 15,000 natives. Together with families, this means that the communities in which they live have a population of 60,000. Kilo Moto has built schools, libraries, and hospitals to care for the needs of the workers and their families. This has produced an unusual spirit of harmony between the employer and employees which is characterized by the fact that the average laborer remains with the company for at least 10 years.

Up to January 1, 1955 the gold mines had produced 238,000 kilograms (about 7,650,000 ounces) of gold. For the last few years, annual production has reached 7,500 kilograms annually (about 241,000 ounces) and will probably remain at this level for some time barring unforeseen circumstances.

First Discovery

Auriferous placers were first discovered in 1903 by two prospectors on the Agola River, a tributary of the Ituri. Some three months later the same group located other alluvial deposits a considerable distance to the north of the Moto River. The Kilo Moto Company now has a huge mining concession which measures about 75,000 square kilometers and encompasses both of the districts disclosed by the early discoveries.

The two mining camps are separated by nearly 300 kilometers. The southern region is covered by equatorial forest below the 1,300-meter (about 4,260 feet) elevation, and by Savannas above this level. The northern area takes the characteristic aspect of sub-desert vegetation.

Remote Location

If any other metal but gold had been found it is safe to say that development of the deposits would have taken place at a much later date. This was due to the remoteness of the deposits. But the equipment requirements for working the placers was not extensive for small operations.

These factors entered the picture before large-scale development could take place: Roads had to be constructed; decent living quarters had to be erected for the European staff and native workers; material, supplies and medical facilities had to be assured. From the technical point of view, an inventory of minerals and deposits had to be undertaken in order to answer the fundamental question: What is there to be done?

An exploration department was established to study the region and determine the extent of the gold deposits. Recent prospecting has been

confined to areas of active ground water circulation.

Geology

According to early geological assumptions, the Kibali group, made up of Pre-Cambrian metamorphic rocks, was the center of an extensive granitic intrusion, and thus formed a relatively thin mass resting on the batholith. It was felt that the gold veins would be found near the confining zone between the batholith and the schistoid zone in the Kibali. Later observations in recent years agree with these ideas generally.

It should be brought out, however, that recent seismic work indicates that deeper lying formations do not conform to the classic concept of a metamorphic aureole. The supposed batholith is not approached. Mr. R. Woodtli has demonstrated that the schistosity of the Kibali is a superficial phenomeron, produced by phyllistization, and which rarely extends itself under the hydrostatic level. The part played by the intrusive in this process is very effaced. It is generally agreed the magma has produced certain changes in the Kibali, but these changes do not have the amplitude which is often attributed to them on the basis of fragmentary observations.

Prospecting Guides

The origin of the gold veins is open to question. All disappear at depth. Further, only chemical analysis permits the demarcation of auriferous limits. The separation between a rich and a barren zone, nevertheless, is always clear.

The odd geologic environment has resulted in a unique guide for exploration. The idea of gold veins based on a magmatic hypothesis has been discarded. Instead, prospecting is concentrated in areas where there has been a more active circulation of ground water.

Evolution of Milling

The first deposits to be developed were the placers which were worked with hand shovels, and riffles were used to concentrate the gold. Subsequently, mechanical shovels and mobile ore washeries were substituted. Jig and table concentrates were passed over an amalgamation board. The amalgam, after being pressed to carry off the excess of quicksilver, contained 30 to 50 percent gold and 50 to 70 percent mercury.

This relatively simple method of recovering the gold was soon outmoded when the emphasis of operations was shifted to the veins. Simple

CONGO WORKER in an underground mine of the Kilo Moto Company. Production was once confined entirely to working surface placers using crude hand methods. Today the operations are highly mechanized and exert a strong social and civilizing influence on natives.

GOLD from the vast Kilo Moto concession is reclaimed by a wide variety of methods. This photo shows a hydraulic monitor in action. Annual production from all sources amounts to nearly 241,000 ounces.

NATIVES soon learned how to operate mechanized equipment.

ORES from underground mines are more complex and cyanidation is necessary.

ALLUVIALS are still mined but the yardage handled has been greatly increased by the use of trucks and modern methods. The truck in this picture is about to dump a load of gravel into a sluice box at one of the washing plants belonging to Kilo Moto.

VEIN CAPPING is recovered by using small and medium size pits and quarries located on the surface. Gold was first discovered in the northeastern section of the Belgian Congo in 1903 by two prospectors.

quarries on the vein cappings were soon transformed to underground mines.

Since more complex ores are now mined in the district, the milling practice has undergone considerable renovation. Surface workings yielded gold which was readily recovered by simple gravity methods. However, underground stoping of ore containing gold in a finely divided state meant a change to finer grinding and cyanidation in order to obtain suitable metallurgical recoveries.

Treatment

A typical mill generally consists of two integral crushing and gravity recovery sections and one cyanide plant. One section of the crushing and gravity section treats only the richer portion of the mine-run ore, and the gravity tailing reports to the cyanide plant. The second section, fed with low-grade ore, makes a finished tail and the gravity concentrate is further processed by cyanidation.

Crushing is accomplished in two stages which reduces the ore to 1-inch in size. The feed is then conducted to a series of jigs and tables and the gold recovered from the gravity concentrates on amalgamation plates. If high-grade ore is being milled, gravity tailing is further reduced in size to minus 100 to 150 mesh in a 6- by 4-foot ball mill. Lime added to pulps entering the ball mill controls the pH at between 6.5 to 7 for subsequent cyanidation.

LIVING CONDITIONS are very good at any of the company dwellings.

The product from the ball mill is dewatered to two parts of liquid to one part of mineral before it enters a series of agitators of the Denver-Wallace type. The quantity of cyanide added amounts to about 700 to 1,000 grams per cubic meter of pulp. After several hours of agitation the pulp is washed by counter current decantation. Pregnant solution is drawn from the first thickener for precipitation by the Merrill-Crowe process. Lead acetate is used to clarify solutions before they enter the Merrill-Crowe step.

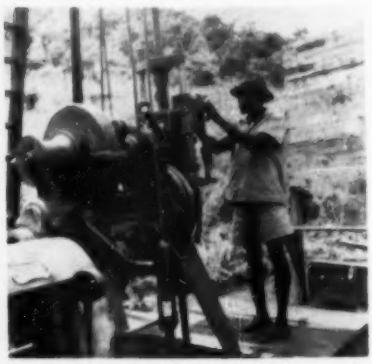
The quantity of lime required varies depending on the characteristic of the ore and the mill water. Some ores contain sulphates which lead to acid formation in solution, and this, of course, destroys the protective alkalinity required for the cyanide method of gold recovery.

The distribution of mill recoveries of gold from an average head feed of 10 grams of gold per metric ton is as follows: 60 percent is extracted by gravity and amalgamation; 35 to 38 percent is recovered by cyanidation. Overall mill recovery is 97 to 98 percent, and tailing contains 0.2 to 0.3 grams of gold per metric ton. The amount of high-grade and low-grade ore handled by the two crushing and amalgamation sections varies quite widely.

The industrialization of the Kilo Moto operations in the northeastern section of the Congo has increased to meet the demands of our times.

FINE HOSPITALS, of which this one is just an example, care for the needs of the employees and their families. Schools, libraries and recreation centers have also been established. The average worker remains with the company over 10 years.

BALL MILLS, 6 by 4 feet in size, grind the ore to minus-100-mesh before the pulp enters the cyanidation section.



A CONGO WORKER at a diamond drill rig. Core samples have turned up much of the fundamental geological information.

LIFE OF DISTRICT is extended by block leasing which also hikes miners paychecks. Shown above at the left is Fred Traylor tramming a mine car at the Stoll lease. At right, is Hugh Carlin working at the surface of the Davis lease.

Block leasing

At Atolia It Pads Paychecks

Block leasing is playing an important part in keeping the famous California tungsten camp of Atolia alive. Too, block leasing is important to those miners who wish to work for themselves independent of company rules and time clock punching. Then too, there is always the chance that the next round will disclose one of Atolia's high-grade pockets.

The most important tungsten producer in the district is the Surcease Mining Company whose operations are located at Atolia, on the northern edge of the Mojave Desert, near the communities of Red Mountain, Johannesburg, and Randsburg, on Highway 395 at the county line between San Bernardino and Kern counties, California. The tungsten is scheelite, with current recovery through three divisions of operations: hard rock open pitting; flotation of old tailings; and underground block leasing. The latter is the major source of production.

The property is extensive, covering a mineralized structure about a mile wide and two miles long, dotted with many separate workings varying from shallow shafts to the 1,200-foot-deep Union mine.

The special nature of ore occurrence makes it a "natural" for block leasing which has been practiced here for many years. The ore occurs in relatively small but high-grade shoots, and with the scheelite concentrated rather than disseminated. "Sack ore" up to 60 percent WO_3 is not unusual, and anything under 0.5 percent is considered waste. A seam of high grade only one inch thick will pay to carry a working face. Thus, relatively small tonnages are involved in the recovery of the high values. Large "stake" is

(Typical)

SETTLEMENT SHEET
Doe-Roe Lease
11/25/55

LOT 765, 14 tons, milled 11/18:		
—Higrade: 416# at 52.08% = 216.65 lbs. WO_3 or 10.832 units at $61.92		$670.72
—Milling Ore: 1,022# at 66.18% = 676.36 bs. WO_3 or 33.818 units at $63.00		2,130.53
		$2801.25
SETTLEMENT: at 50%		$1400.63
LESS: Insurance	$20.00	
Powder, caps, fuse	55.65	
Steel & bits	16.85	
Misc. supplies & parts	17.68	
Sales tax	2.70	
Installment on machine	128.85	
		241.73
		$1158.90
DISBURSEMENT:		
John Doe: 579.45 less advances	$125.00	$454.45
Richard Roe: 579.45 less advances	$130.00	$449.45
Lode—Piute area		
3.19% ore (incl higrade)		

DEEPEST WORKINGS are entered through the 1,200-foot Union shaft which serves the Tramill and Martinez leases.

always a possibility in this type of mining.

The general arrangement is that the company provides the lease area; air, where feasible; and does the milling and marketing. Lessees do the mining with their own tools and equipment. Sales income is evenly split. Lessees may draw payments against their accumulating ore and are paid in full as soon as milling is completed. The Independent Contractor status of lessees is strictly maintained, but various forms of mutual cooperation are exercised. Special incentives are sometimes provided by the company where appreciable amounts of dead work are required to get into indicated pay zones.

An indispensable ingredient of successful block leasing practice is absolute trust and confidence between company and lessees. While uniform formal written leases are always drawn, much of the procedure detail is based on such mutual trust and thus undue red tape is avoided.

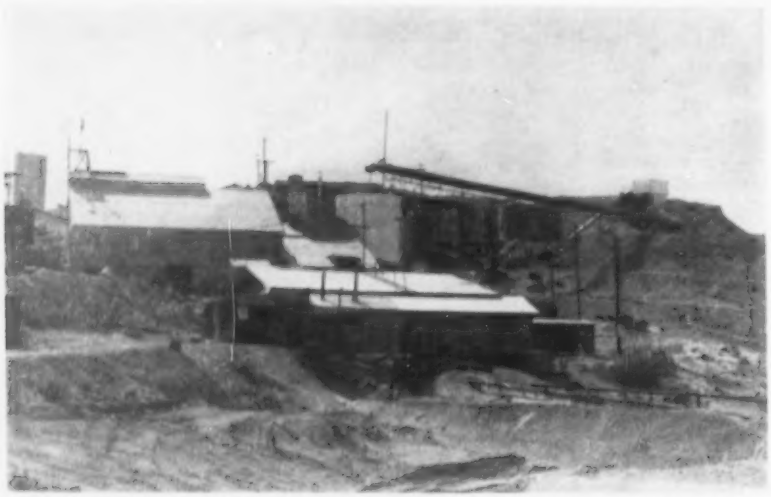
The ore is free milling, with gravity concentration followed by special treatment, for certain fractions, to make grade and purity specifications. Ore is picked up by company truck at lessees workings when milling lots of five tons or more are ready. Each lot is milled separately, value determined from the cobbed high grade and the concentrate, and settlement made as soon as assays are received. Supplies, which are carried by company for lessees' convenience, are charged at cost to respective lease accounts as used and are deducted from settlements.

Lessee workings vary from the simplest shallow diggings to those on the lower levels of old mine workings. They generally work in pairs on a simple partnership basis. There are occasional lone operators, while other groups include up to five or six partners. A special form of accident insurance has been worked out to provide coverage to all lessees at cost. There are generally 20 to 30 leases in effect, involving 50 to 75 men.

Average earnings per man are considerably better than normal wages, with an occasional good "strike" being made. The main problem is finding the high-grade spurs and shoots that occur, rather than their extraction. Hence the big rewards generally accrue to those willing to take the risks of dead work in exploration.

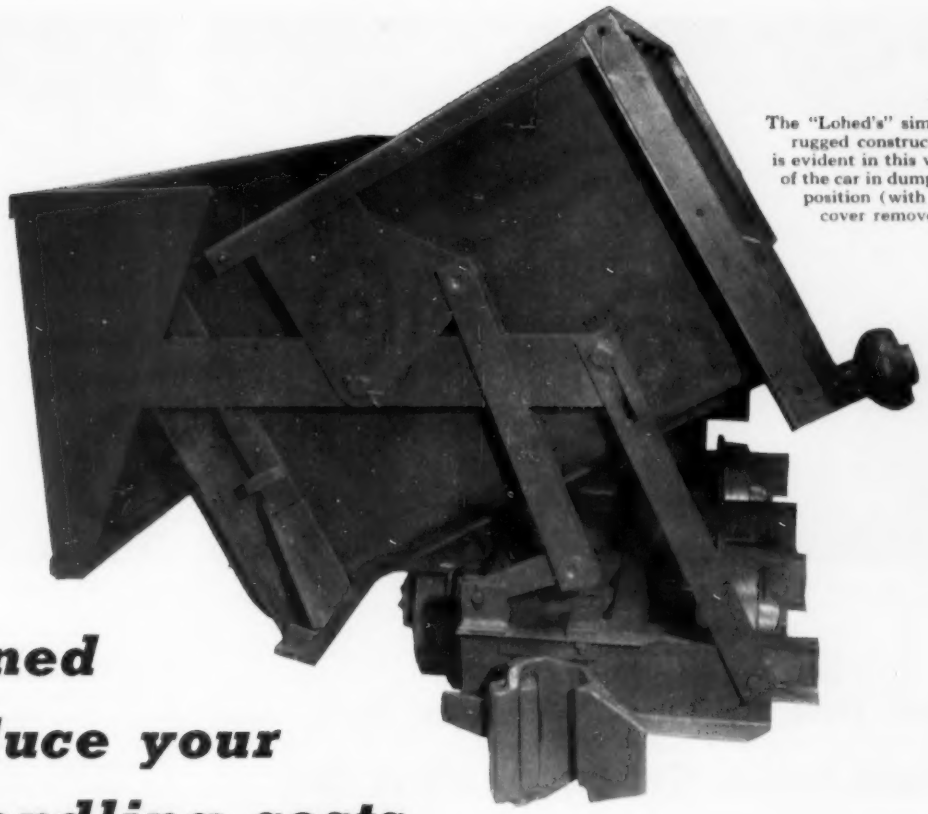
Many prospects for further leases are available and the company continues to develop new ones right along. Good block leasing prospects, incidentally, are also a byproduct of open-pit operations. While all lessees do not necessarily make good, diligent all-around miners can invariably make at least good "wages," enjoy the independence of working for themselves, and have the chance of making a real "stake." The opportunity is there—and the many new cars driven by lessees attest to successful results.

Paul D. Hoefling is resident manager. Frank Bâby supervises the leasing program, and provides mine engineering and other services for the lessees. Mine office is Red Mountain, California, for operations which are largely autonomous, although the company maintains its main business office at 214 30th Street, Sacramento, California.



ORE IS FREE MILLING with gravity concentration followed by special treatment to meet grade and purity specifications. This picture shows Surcease Mining Company's Barker mill where lessees' ores are handled.

CHANCES OF HITTING RICH ORE, in which the lessee shares along with the company, provides a good incentive for miners to undertake exploration. Shown standing at the headframe of the Elder Prospect shaft, a typical lease, is A. Napolis.



The "Lohed's" simple, rugged construction is evident in this view of the car in dumping position (with end cover removed).

Designed to reduce your ore handling costs

75 years experience aimed at one goal—reduce ore handling costs. That's the design and development story of Lake Shore's complete line of mine cars and related ore handling equipment.

Here's a typical example of this development . . . the "Lohed" mine car. With all welded construction it stands up better than the old rivet type car under the hard knocks of everyday operation. Its simplified design is strong . . . yet light in weight. Rounded corners add stiffness, prevent ore sticking . . . mean faster, cleaner dumps.

What's more, inspection and maintenance, when it's needed, is a snap. Just pull six pins to remove the car body from the truck.

Features like these add up to greater production, less down-time, lower maintenance costs, *reduced ore handling costs*. This advanced thinking is engineered into every Lake Shore car—standard and special models. Before you buy, talk to the people at Lake Shore and see how these advantages can be applied to your operation, to help you move more ore at lower cost.

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How Iron Miners Cut Costs To Offset Lower Grades Of Mine Ore

Three days of intensive discussions of mining problems highlighted the annual gathering of Minnesota and Upper Michigan mining men in Duluth, Minnesota early in January. The Minnesota section of the AIME held its 29th annual meeting followed by the two day sessions of the Mining Symposium sponsored by the University of Minnesota for the 17th year.

The large attendance at all meetings was evidence that the engineers charged with the production of iron ore are as vitally concerned with rising costs in face of declining ore grades, and how they can be reduced, as they are with the more technical aspects of specialized situations reported at the sessions.

To open the meeting, Frank Werther, supervisor of underground operations, Pickands Mather and Company, discussed "Soils Solidification in Tunnel Driving." This paper dealt with the problems encountered while driving a 9-foot inclined tunnel at the Tioga No. 2 mine near Grand Rapids, Minnesota. Mr. Werther pointed out that quicksand was encountered to such an extent that operations ceased until some means of overcoming the situation could be devised. Grouting was attempted with no results and finally the Chemical Soil Solidification Company of Chicago was called in to work out the problem. Sodium silicate and calcium chloride were the chemicals which, when pumped into the quicksand, solidified it so that the tunnel could be completed. He reported that this method was dependable although somewhat expensive, but that the equipment used was easy to set up and provided a quick solidification so that the work could progress.

"Manganese from Domestic Ores by the Ammonium Carbamate Process" was the title of a detailed paper given by Jay Y. Welsh of the Manganese Chemical Corporation. Mr. Welsh reported on his company's operations in the extraction of manganese from Cuyuna Range iron-manganese ores at its plant at Riverside, Minnesota. The success of Manganese Chemicals in the extraction of manganese from low grade ores marks the beginning of a new industry with promises of supplying metallurgical grade manganese at a price competitive to foreign ores.

Inadequate Mineral Policies

Elmer W. Pehrson, chief, Division of Foreign Activities, U. S. Bureau of Mines used as his theme "National Security vs. Mineral Imports" and explored the problems involved in the threat to our national security posed by the increasing imports of base metals. Mr. Pehrson very carefully stated that his remarks represented his own thinking on the subject and did not reflect the national policy, but he did strike a responsive chord with many of the people who heard him. He pointed out that our national policies are inadequate and are encouraging the trend toward dependence on other countries for our strategic metals. We are, he said, in a period of declining self-sufficiency and that there should be national recognition of the problem and that some severe limitations should be placed on importation

ROBERT W. BELL

ELMER W. PEHRSON

of metals. He favors a reasonable subsidy of those metals where the resource is limited to encourage production and exploration.

The "Drilling and Blasting" session was led by Hugh J. Leach, manager, Minnesota Mines, Cleveland-Cliffs Iron Company. Robert W. Bell, mining superintendent, Erie Mining Company, Aurora, Minnesota led off with a discussion of blast hole drilling in taconite. He pointed out that Erie was currently using three types of machines, and that all three were proving satisfactory for certain phases of the work. Jet piercing with the Linde machine has proven highly successful in solid ground but the rotary machines have proven much better for broken or faulted areas.

Kenneth Olson, superintendent, Humboldt mine, Cleveland-Cliffs, Ishpeming, Michigan gave his views on the drilling problem encountered in the Humboldt "jasper" ores and reported that both the jet and rotary machines worked well. He feels that with some improvement both types of drilling will be standard for the harder iron ores.

R. C. Wallace, assistant general manager, Minnesota Mines, M. A. Hanna Company reported on the experience of his company with the various types of drills and then covered the growing use of the new Akremite blasting agents. He was followed by R. L. Akre, co-inventor of the new product who gave the group some most interesting data on the use of the product.

This portion of the symposium wound up as practically a panel discussion of the Hughes rotary bits, their operating characteristics, and their limitations. It was generally conceded that the Hughes bit and rotary drilling was the answer to rapidly rising drilling costs and that the practical application of this method to softer ores was just a matter of time.

Iron Ore Flotation

The panel session on flotation was led by Donald W. Scott, general manager, Continental Machines Company and the panel was made up of Fred DeVaney, chief metallurgist, Pickands Mather & Co.; Milton Williams, associate chemical engineer, Oliver Iron Mining Division; and Louis J. Erck, chief metallurgist, Cleveland-Cliffs.

The panel generally agreed that there were many of the iron ores which were amenable to flotation and the problems being researched were those of extending the present recovery processes to increase the grade of the recovered product. Mr. Erck pointed out that the Michigan ores by their nature were better suited to flotation, but, while they had their problems, this method was proving satisfactory. The Minnesota ores pose problems of such magnitude that for the forseeable future no attempts will be made to utilize flotation. However, the taconites are a different matter, according to the panel, and many of the taconites can be recovered satisfactorily by this method.

A review of the "Aerial Tramway Stockpiling at the Peterson Mine" was given by Peter F. Torreano, assistant superintendent, Peterson mine, Pickands Mather & Company. This was followed by a film on the same operation by Orlo H. Carlson, district mechanical engineer, Gogebic Range, Pickands Mather & Company.

William B. Stephenson, vice president, Allen-Sherman-Hoff Pump Company, discussed materials handling pumps, their selection, application and operation.

Generally speaking, the meetings were excellent, the attendance good and the subjects of prime interest to the industry. As it is with other phases of mining, the iron ore producers are preoccupied with almost insurmountable problems of rising costs and declining production in terms of grade of ore.

FRED D. DeVANEY

PETER F. TORREANO

JAY Y. WELSH

Capitol Concentrates

Continued from page 41

newly mined gold. The world, in general, seems to be moving steadily toward some sort of free gold markets, however. Belgium and England now have free gold markets which do a land-office business, and gold trading rules have been liberalized in France, Italy, and West Germany. Canada subsidizes its gold production and South Africa is pressing strongly for an increased world gold price.

• Another Contract Settlement Bill

On January 3, 1956, Representative Lanham of Georgia introduced H. R. 7924, another in the long chain of bills to amend the Contract Settlement Act of 1944 and authorize payment of fair compensation to producers of strategic and critical minerals or metals in cases of failure to recover reasonable costs.

The first bill to reimburse mineral claimants for World War II losses was introduced in 1948 by Senator James E. Murray. It and all of the succeeding measures have met strenuous and continued opposition from Administration forces and all have failed to pass.

• Labor Program Is Indicated

Labor Secretary Mitchell has outlined a six-point legislative program for presentation to Congress which repeats the Administration's labor legislation requests of last year, except for a proposal on union pension and welfare funds already backed by the AFL-CIO.

This proposal would request Congress to enact a law requiring registration of union pension and welfare funds and disclosure of their financial transactions. Actual supervision of such fund, however, should be left to the states, Mitchell said.

According to Mitchell, the Administration again will seek: expanded coverage under the minimum wage and hours law; some Taft-Hartley Act revisions, including permission for strikers to vote in NLRB representation elections and a requirement that the employers file non-Communist affidavits; more liberal benefits under the longshore and harbor workers law; changes in District of Columbia laws concerning disability insurance and unemployment compensation; and grants-in-aid to states for industrial safety programs.

COMING CONVENTIONS

February 2, 3, and 4, 1956. NATIONAL WESTERN MINING CONFERENCE, sponsored by the Colorado Mining Association and affiliated groups. Shirley Savoy Hotel, Denver, Colorado.

February 20 through 23rd, 1956. Annual Meeting AMERICAN INSTITUTE MINING and METALLURGICAL ENGINEERS, New York, New York. Headquarters hotel, Statler; banquet hotel, Waldorf-Astoria.

March 18 through 24, 1956. Joint meeting of the AMERICAN MINING CONGRESS ON SURVEYING and MAPPING and the AMERICAN SOCIETY OF PHOTOGRAMMETRY, Shoreham Hotel, Washington, D. C.

March 19 to 21. INDUSTRIAL DIAMOND SYMPOSIUM, Illinois Institute of Technology, Chicago, Illinois.

April 23 through 25, 1956. Colorado School of Mines SYMPOSIUM ON ROCK MECHANICS, Golden, Colorado.

May 10 and 11. Two-day MINING CONGRESS ON SIGNIFICANCE OF ATOMIC ENERGY sponsored by Southwest Research Institute and Atomic Industrial Forum. San Antonio, Texas.

June 7 to 9, 1956. THIRD INTERNATIONAL LIGHT METALS CONVENTION, Montanistische Hochschule, Leoben, Austria.

June 25 through 29. Annual Meeting AMERICAN SOCIETY FOR ENGINEERING EDUCATION, Iowa State College, Ames, Iowa.

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Personalities in the News

PAUL T. ALLSMAN (right) has been named chief mining engineer of the Bureau of Mines by approval of Secretary of the Interior Douglas McKay. He succeeds EUGENE D. (ED) GARDNER who retired earlier this year. Mr. Allsman, a member of the Bureau since 1936, most recently was assistant regional director for metals and minerals of the 27-state Eastern Region. In his 19 years of service with the Bureau of Mines, Mr. Allsman has supervised exploratory operations in Montana, Nevada, and Utah; was principal mining engineer in the 11 Western states during World War II exploratory drilling for critical minerals; and has held positions as chief of the mining division in the Rocky Mountain Region, regional director of the North-Central Region and of the former Southern Region which had headquarters at Knoxville, Tennessee. Previous to his service with the Bureau of Mines, Mr. Allsman was employed at the Jerome, Arizona operations of the United Verde Copper Company, now part of the Phelps Dodge Corporation.

George H. Teal, W. E. Burleson, R. R. Williams, Jr., and **D. W. Viles** have been appointed to the Colorado state metal mining fund board. Appointed to Colorado's mineral resources board were **Charles Jordon, Lew Williams, Oscar H. Johnson,** and **Joseph M. Smith.**

J. L. Whiteside has been named plant manager of the Monsanto Chemical Company elemental phosphorus plant at Monsanto, Tennessee. **Robert R. Rumer,** who was formerly production superintendent at the Tennessee plant, succeeds Mr. Whiteside as plant manager in Idaho. Moving up to succeed Mr. Rumer is **Ralph Neubert,** formerly maintenance superintendent, and he will be replaced by **William G. Allen.**

W. L. Zeigler, general manager of Pend Oreille Mines and Metals Company in Spokane, Washington, has been appointed consultant to Bunker Hill & Sullivan Mining and Concentrating Company. Mr. Zeigler will continue with Pend Oreille as consultant and director. **L. M. Kinney** has been promoted to resident manager at Pend Oreille's Metaline Falls operations, while **Loren G. Billings** is now superintendent.

Thomas B. Nolan has taken over duties as director of the United States Geological Survey replacing **William E. Wrather,** who has been in ill health during the past year. Mr. Nolan was formerly assistant director of the survey.

George W. Colville was recently appointed general manager of the Bagdad Copper Corporation, Bagdad, Arizona, to succeed the late Ernest Russell Dickie. Mr. Colville was formerly assistant general manager.

Frank J. Maloit, formerly general superintendent of the Empire Zinc Division of The New Jersey Zinc Company, has been named Western manager of mines for the company and now has headquarters at Gilman, Colorado.

J. F. Buchanan has been appointed assistant general manager of operations, Magma Copper Company and San Manuel Copper Corporation, located at Superior and San Manuel, Arizona. Other appointments at the Superior operations are **C. B. Foraker,** general manager, and **J. L. Draeger,** mine superintendent. At San Manuel, **F. H. Buchella** is general manager and **E. K. Staley** has been named assistant mine superintendent.

Robert H. Chisholm has resigned from Pacific Isle Mining Company at Hibbing, Minnesota, and accepted a position as assistant to the president of Carbon Limestone Company near Youngstown, Ohio.

Henry F. Adams, concentrator superintendent for Inspiration Consolidated Copper Company at Inspiration, Arizona, has retired after 36 years with the company.

J. Stanley Mitchell, has been named plant superintendent of Calera Mining Company's cobalt refinery at Garfield, Utah. Mr. Mitchell joined Howe Sound Company, the parent company, as mill superintendent at the Chelan division in Washington.

Walter R. Shaw has been named refinery and chemical plant superintendent at the Carlsbad, New Mexico operations of International Minerals and Chemical Corporation. Mr. Shaw has been process engineer since he joined the company in 1954. Other promotions at Carlsbad have advanced **J. W. Shores** and **Eldon L. Sanders** each to the position of face boss in the mine department.

John Gray has taken over duties as general superintendent of Miami Copper Company and its wholly owned subsidiary, the Copper Cities Mining Company at Miami, Arizona. Mr. Gray has been with the company for 15 years and was most recently assigned

R. W. WHITNEY, (right) formerly general manager of Minnesota mines for M. A. Hanna Company, has been transferred from Hibbing, Minnesota to the company's Cleveland, Ohio office where he will be general manager of mines under R. C. FISH, vice president in charge of operations. Mr. Whitney joined Hanna Company in 1946. B. M. ANDRESS succeeds Mr. Whitney as Minnesota manager of mines, while ROBERT C. WALLACE has assumed assistant manager duties. ROBERT B. CRIST has become general superintendent of the Minnesota division, succeeded by FRED E. DYSON as superintendent of Butler properties at Cooley, Minn.

to exploration activities. He succeeded **Jack Still** who has resigned. **Maynard M. Stover** has become mine superintendent of Copper Cities Mining Company.

Harold L. Grant has been appointed vice president and chief of mining engineering and geology of the Balcones Corporation Exploration and Drilling, San Antonio, Texas.

James L. Carne has taken over duties as chief mine engineer for Inspiration Consolidated Copper Company at Inspiration, Arizona. He is succeeded as assistant chief mine engineer by **Carl W. Brick.**

Elmer V. Reinhardt, consulting geologist, specializing in uranium, can now be reached at 111 Donaldson Road, Grand Junction, Colorado.

John Anderson has been promoted to the position of assistant general superintendent of Manganese, Inc. at Henderson, Nevada. His successor as mill superintendent is **Bob Blake** who was formerly with American Smelting and Refining at Black Lakes Asbestos in Canada.

Chris Mason has advanced to the position of consultant for the Utah

FAHRENWALD

BUCHMAN

The American Institute of Mining and Metallurgical Engineers has announced the recipients of its annual awards, which will be presented at the organization's annual meeting in New York City in February. Included in the list of industry leaders so honored are (left to right): HENRY DEWITT SMITH, president of the AIME in 1955, and chairman of O'okiep Copper Company, Ltd., who will receive the Charles F. Rand Gold Medal for mining administration; LOUIS D. BUCHMAN, formerly vice president and director of Kennecott Copper Corporation, Salt Lake City, Utah, who will receive the William Lawrence Saunders Gold Medal for achievement in mining; ARTHUR W. FAHRENWALD, dean of the school of mines at the University of Idaho, who is to be given the Robert H. Richards Award for his achievements in minerals beneficiation; and CHARLES R. KUZELL, general manager, Phelps Dodge Corporation, Douglas, Arizona, who will be presented with the James Douglas Gold Medal, which is awarded for distinguished achievements in nonferrous metallurgy. Other awards to be presented by the AIME at the meeting include the Robert Peele award, which will be given to INGVAR JANELID, professor of mining and surveying, The Royal Institute of Technology, Stockholm, Sweden; the Extractive Metallurgy Division Award, which has been designated for T. R. A. DAVEY, Hamburg, Germany; Daniel C. Jackling award, which goes to JAMES B. MACELWANE, professor of geophysics and geophysical engineering, St. Louis University; and the Robert W. Hunt award, which will be presented to OTWIN CUSCOLECA, technical director, Alpine Montan, Leoben, Peter Tunnerstrasse, Austria.

Construction Company at Cedar City, Utah. In his place as superintendent of local operations is **Boyd Paulson.** **E. C. DeMass** has been promoted to assistant superintendent.

Allan E. Jones has been appointed manager of the U. S. Atomic Energy Commission's Grand Junction, Colorado, operations office. He succeeds **Sheldon P. Wimpfen.** Mr. Jones has been deputy manager of the office since September of last year and before that was Atomic Energy Commission representative in Johannesburg, South Africa, where he served with the Combined Development agency.

C. D. (Mike) Michaelson has been named head of Kennecott Copper Corporation's western mining division. He joined Kennecott in 1948 when he became general superintendent of the Braden Copper Company in Chile, which is Kennecott's principal South American subsidiary. In 1952 Mr. Michaelson was appointed vice president and director of the company and has held that position until his recent promotion.

Kefton H. Teague has joined the Industrial Minerals Division of International Minerals & Chemical Corporation as geologist under the supervision of **Frank R. Hunter,** division geologist. Mr. Teague was formerly employed by the United States Geological Survey and the Tennessee Valley Authority.

L. F. PETT (right), general manager of the Utah Copper Division of Kennecott Copper Corporation, has taken over the duties of president for the Utah Mining Association. Elected to serve with Mr. Pett were: CLARK L. WILSON, vice president of New Park Mining Company, first vice president; Charles A. STEEN, president of Utex Exploration Company, Inc., second vice president; A. G. MACKENZIE, vice president and consultant; MILES P. ROMNEY, secretary-manager; and WALTER M. HORNE, assistant secretary-manager.

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Thomas S. Nye, U. S. Atomic Energy Commission geologist, has been assigned to the Alpine-Marfa, Texas area in connection with the AEC's uranium exploration activities in the Trans-Pecos region of Texas. Mr. Nye has been with the Albuquerque, New Mexico sub-office of the AEC.

Charles Will Wright, mining consultant, is returning to Sicily this month to do a consulting job for the Sicilian American Sulphur Company. He was conducting geological and mining investigations last May just prior to an automobile accident which hospitalized him for some time. Mr. Wright is associated with World Mining Consultants, Inc., Washington, D.C.

Donald McKechnie and **Sterling S. Huyett,** New Jersey Zinc Company, have received promotions. **Mr.** McKechnie, assistant superintendent of the Franklin-Sterling operation in New Jersey, has been named superintendent. Mr. Huyett, assistant to the general superintendent at the Friedensville mine in Pennsylvania, will take over the superintendent's position at that mine.

Francois Fischer, formerly chief metallurgist at Manganese, Inc., Henderson, Nevada, has accepted a position as engineer for a government contractor in New York City. **Mr. Fischer** was previously process engineer for Dorr-Oliver Engineering Company in western Europe.

George Martz, Southwest Potash Corporation, has been promoted to assistant mill superintendent. Other appointments at the New Mexico operation include **John Shackleford,** named mill shift foreman, and **Carlos Bennett,** promoted to mill maintenance foreman.

Earl M. Lovejoy, until recently a geologist with the United States Atomic Energy Commission, has resigned that position to engage in geological consulting. His headquarters are in Reno, Nevada.

Raymond E. Tuttle, International Minerals & Chemical Corporation, has been made manager of the new technical department for the Bonnie phosphate chemicals plant near Bartow, Florida. Mr. Tuttle has been chief process engineer at Bonnie for the past year.

C. A. Bjork was recently named general superintendent by the Montreal Mining Company. **Dan S. Young** was appointed superintendent and **C. K. Guenther,** assistant superintendent.

Newsmakers in International Mining

E. P. CHAPMAN, JR. of the Albuquerque, New Mexico consulting mining engineering firm of Chapman and Wood, is scheduled to make a three-months reconnaissance and evaluation of mineral potentialities in the Kingdom of Yemen. Mr. Chapman has had wide experience in gold, base metals, and uranium mine operations and geologic examinations in the United States and Mexico since his graduation from the Colorado School of Mines in 1953.

Eihar Slaatto, staff member of the Ministry of Industry in Oslo, Norway, has finished his work with the United Nations Technical Assistance Program in Rangoon, Burma, and is returning to Oslo.

A. E. Janes and **J. H. Thomlinson** have been appointed directors of Rukuba Tin Mines in Malaya.

Two new directors have been appointed by Compagnie Geologique et Miniere des Ingenieurs et Industriels Belges, Belgian Congo tin producers. **Jean Verdussen**, manager, Union Miniere du Haut-Katanga, and **Robert Schwennicke**, director and manager, Symetain Societe Congolaise, are the new board members.

M. C. Brandes, mining engineer, is leaving the Belgian Congo very soon and will be staying temporarily at Kweekduinweg 1, Overveen, Holland.

John Jesse Hayes has been appointed chief geologist of the Marcona Mining Company in Peru. Dr. Hayes was formerly with the Orinoco Mining Company in Ciudad Bolivar, Venezuela as a mining geologist.

A. E. Somers, recently appointed to the board of the Chinese Engineering and Mining Company in Malaya, has been elected chairman of the board. R. Dudley Williams, M. P., former board member, resigned due to pressure of other business.

Hans Neeb, mining engineer, has moved from Germany to carry on his activities as an assistant superintendent at Acerias Paz Del Rio, S. A., in Bogota, Colombia.

E. C. Roper has been elected executive vice president of Howe Sound Company and has transferred to the New York City office. Formerly manager of Britannia Mining and Smelting Company, Limited in British Columbia, a subsidiary of Howe Sound Company, Roper will supervise all Howe Sound operations in the United States, Canada, and Mexico. **George Shipsey**, formerly manager of the Snow Lake division in Manitoba, is now vice president, director, and manager of Canadian operations of Britannia.

R. H. S. Ewins, mining engineer, has moved from East Africa where he was with the Uruwira Minerals Limited at Mpanda, Tanganyika, to San Juan, Argentina to join Mina Castano.

L. T. Morgan, formerly mill superintendent of N. S. W. Mining Company, Pty. Ltd., New South Wales, is now with Rye Park Scheelite N. L., also in New South Wales, as manager of beach sand properties.

C. Friedlaender is resident geologist with Chartered Exploration Ltd., a subsidiary of Anglo American Corporation of South Africa, in Lusaka, Northern Rhodesia.

A. J. Keast, former manager of the Australian Aluminum Commission's Bell Bay plant in Tasmania, is supervising erection of a mill at Mary Kathleen Uranium Mines Ltd., Mount Isa, Queensland, Australia.

L. H. (Jim) Lange, consultant metallurgist of the Galigher Company of Salt Lake City, Utah, visited Mount Isa Mines, Limited, Queensland, Australia several months ago with some ideas for the copper and lead mills there. Mr. Lange was the after-dinner speaker at a meeting of the Mt. Isa branch of the Australian Institute of Mining and Metallurgy during his visit.

H. T. Berry, mining engineer, has left the Ontario Pyrites Company, Limited, in Chelmsford, Ontario, to join the Falconbridge Nickel Mines, Limited, in Falconbridge, Ontario.

L. J. Walker, Australian mining engineer, has assumed the duties of underground manager at Fraser's Mine, owned by Great Western Consolidated N. L., Southern Cross, Western Australia.

Isamu Bada, formerly general manager of the Besshi Mine office of Sumitomo Metal Mining Company, Limited, in Japan, has been transferred to the company's Tokyo office.

H. W. Poole, mining engineer with Consolidated Mining and Smelting Company of Canada since 1920, has recently been promoted to superintendent of the company's Sullivan concentrator in Kimberley, British Columbia. Mr. Poole has been operating superintendent of the mine for the past five years.

New employees at Cerro de Pasco Corporation in Peru include **Joseph Ling**, assistant mine foreman, Cerro de Pasco; **J. R. Spooner**, assistant mine foreman, San Cristobal; **D. R. S. Thompson**, assistant geologist, Goyllarisquizga.

C. E. Halle has returned to Cerro de Pasco Corporation, La Oroya, Peru, after an absence in England of two years. He is superintendent of lead smelting at the operation.

ROBERT JAMES ROSE, smelter superintendent of the Messina Development Co., Ltd., Transvaal, South Africa, is returning to the United States. Mr. Rose, a 1935 graduate of the Colorado School of Mines, worked for the American Smelting and Refining Company for a number of years, spending much of that time at the copper smelter in El Paso, Texas.

E. M. LINDENAU has been promoted from resident manager to manager of Compania Minera Choco Pacifico, a subsidiary of South American Gold and Platinum Company. Mr. Lindenau joined the Colombia dredging company as resident manager early in 1955. Since 1926, Mr. Lindenau has had mining experience in Chile, Venezuela, Honduras, and Arizona.

Duane S. Myers, formerly general superintendent of iron mining operations for the E. W. Coons Company, is now manager of mines for Compania Minera de Huehuetenango in Guatemala. As well as his experiene on the Mesabi range, Mr. Myers' background includes mining in Bolivia. His offices with the lead mining firm are in Guatemala City.

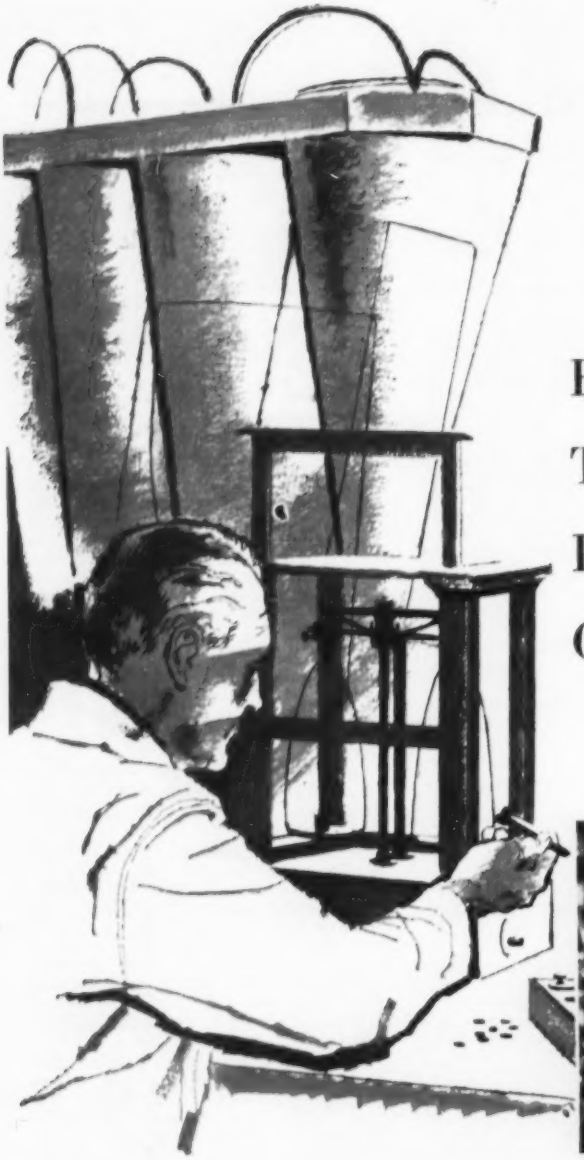
Patrick Savage, Alaskan mining figure, has returned to Fairbanks after completing a season on Long Creek in the Poorman district near Ruby, Alaska.

Leo M. Timmins has resigned as director and president of Chromium Mining and Smelting Corporation, Toronto, Canada.

Cameron E. McKay, formerly with the Natomas Company and the South American Platinum and Gold Company, is the new chief engineer for Cerro de Pasco Corporation, La Oroya, Peru. Mr. Cameron has had extensive mining experience in the western United States and South America and was associated with the U.S. Navy Civil Engineering Corps during World War II.

H. Willis Higgs, metallurgical assistant to the manager of operations for Cerro de Pasco Corporation, La Oroya, Peru, has been promoted to the post of assistant manager of operations. Mr. Higgs joined the corporation in 1949 as assistant superintendent of lead smelting and rose rapidly to his present post. Before coming to Cerro de Pasco, he worked with U.S. Smelting and Refining Company in Helena, Montana.

THOMAS ELLIOTT (right) has been appointed secretary-manager of the British Columbia and Yukon Chamber of Mines, Vancouver, British Columbia. For many years he was assistant to the manager, FRANK E. WOODSIDE, who retired after 25 years in that position. The Bureau serves as a publicity and information bureau for the mining industry and is concerned with the advancement of prospecting and mining development in western Canada. It recently celebrated the 43rd anniversary of its formation.



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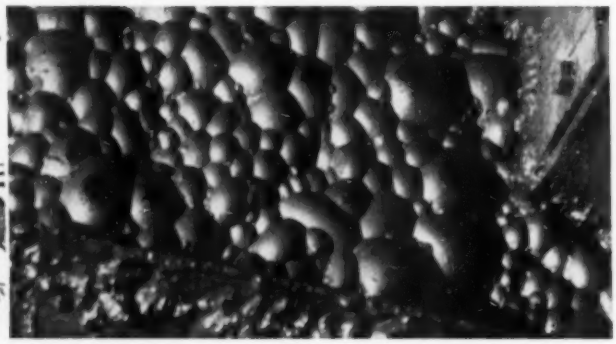

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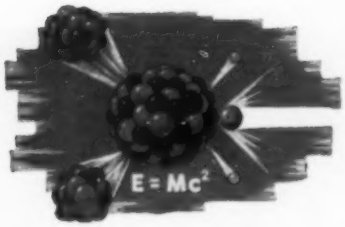

FISSION FACTS

Monthly Roundup of Mining News In the Atomic Energy Field

AEC Leases to be Awarded by Competitive Bidding

The United States Atomic Energy Commission announced that a system of competitive bidding will be instituted for leasing uranium deposits on withdrawn public lands and certain other areas under AEC control. In the past the AEC has awarded leases to selected firms on the basis of qualifications, which included mining experience and financial status.

The new leasing method will be instituted after detailed procedures for putting it into effect are complted. The AEC, however, does not contemplate extensive leasing of AEC-controlled lands in the near future. The uranium deposits on these lands constitute a reserve to be drawn upon as required. Ore production from privately owned properties is being maintained at a high level, so it is unlikely that more than a few deposits will be offered for lease in the near future.

When the new system is put in effect, leases will be awarded to the acceptable bidder offering the highest cash bonus by sealed bid. The royalty rate, work requirements, and other conditions will be stated in the invitation to bid. The only exception will be when it is determined that special circumstances make negotiation preferable in the best interest of the government.

The practice of selecting lessees was adopted by the AEC in 1949 when there was little interest in uranium mining. Since that time the number of qualified companies engaged in mining uranium has sharply increased to a point where the number of lease applicants greatly exceeds the number of leases available.

Power Reactor for Belgium To be Privately Financed

The world's first completely privately financed atomic-electric power plant will be built in Belgium in time to supply electric energy during the Brussels World's Fair in 1958. The design for the new plant is based on the use of a pressurized water reactor that has a generator output of 11,500 kilowatts.

Westinghouse Electric Corporation will build the plant for the Syndicat d' Etude de l 'Energie Nucleaire, an organization of Belgian utilities and manufacturers formed to develop industrial uses of atomic energy in that country. One member of the syndicate is Union Miniere du Haut Katanga, the world's leading producer of uranium.

The power plant will consist of a primary system, composed of a reactor steam generators, pumps and high pressure auxiliary equipment enclosed in a large vapor container, and a secondary system of conventional steam turbine electric equipment which will utilize the heat of the reactor. Liquid waste disposal facilities will be provided to collect and store wastes that may become contaminated.

Mallinckrodt Signs New Contract to Refine U_3O_8

Mallinckrodt Chemical Works has entered into a new four-year contract with the U. S. Atomic Energy Commission for operation of two AEC plants near St. Louis, Missouri which refine ores and concentrates into uranium metal.

At present Mallinckrodt operates a refining plant for the AEC in St. Louis and will take over operation of a new plant being constructed at the Weldon Spring Ordnance Works, about 25 miles south of St. Louis. Under the terms of the new contract, the AEC will pay Mallinckrodt on a cost-plus-fixed-fee basis.

High Grade Uranium Found on Australian Property

Underground development work now being done by Northern Uranium Development N. L. and Uranium Mines N. L. continues to disclose high-grade uranium ore at the El Sharana lease on South Alligator River in the Northern Territory, Australia.

Shaft sinking at the El Sharana is continuing. A cross cut from the Number 1 shaft at the 57-foot level disclosed a lode 36 feet wide which assayed 1.34 percent U_3O_8, while 38 feet of drifting on this lode yielded an average assay of 0.91 percent over a 5-foot width. Diamond drilling of the Koolpin Creek lode has intersected ore assaying 0.35 to 0.45 percent which confirmed earlier drilling.

Atomic Power Roundup

Early in December 1955 an Air Force B-36 Superbomber, carried a General Electric Company atomic power plant aloft for the first time in history. Today a growing number of United States industrial firms are engaged in nuclear research and development programs for atomic reactors. Four companies, however—Westinghouse Electric Corporation, General Electric Company, Babcock & Wilcox Company, and North American Aviation—have carried off the major share of the contracts awarded by the U. S. government. Here's a brief summary of some of the most important work now going on.

WESTINGHOUSE ELECTRIC: Westinghouse has a $37,500,000 contract for the nuclear portion of the nation's first power plant to be operated by Duquesne Light Company at Shippingport, Pennsylvania. It will build for a Belgian syndicate a $5,000,000 atomic power plant, details of which are reported elsewhere on this page. The company will build for itself a $6,500,000 test reactor and has a $12,400,000 Navy contract for two submarine reactors, plus a $25,000,000 contract for a prototype propulsion unit for an aircraft carrier. They will build for Pennsylvania Power & Light Company a 150,000-kilowatt power plant which is to be completed by 1962. Westinghouse built the atomic power plant for the submarine Nautilus.

GENERAL ELECTRIC: This firm will build, near Chicago, a $45,000,000 nuclear power station for Commonwealth Edison Company and Nuclear Power Group, Inc. which will be completed in 1960. General Electric is constructing a $23,000,000 submarine prototype and will produce a power plant for the Navy's second atomic submarine, the Sea Wolf. Investigations are now underway by the company for developing a propulsion unit for airplanes under a government contract. General Electric of Canada is putting in an atomic station for Ontario Hydro in Canada.

NORTH AMERICAN AVIATION will build a power reactor for Consumers Public Power District in Nebraska. They have already sold two research reactors and have two more operating in California.

BABCOCK & WILCOX will erect an atomic plant for Consolidated Edison Company of New York near Peekskill on the Hudson River; completion date is 1959. They are building a research reactor for the University of Michigan.

KAISER ENGINEERS, a division of Henry J. Kaiser Co., has been awarded a $15,000,000 contract to build a test reactor at the AEC National Reactor Testing Station at Arco, Idaho.

ALCO PRODUCTS INC. is building a $2,000,000 prototype, package power station for the army at Fort Belvoir, Virginia.

GENERAL DYNAMICS, Convair Division, will construct a medical research reactor for the Lovelace Foundation at Alberquerque, New Mexico.

AMF ATOMICS INC. a child of American Machine & Foundry, is building research reactors for Batelle Memorial Institute and for the University of Buffalo.

Several other proposed power plants are under consideration. Yankee Atomic Electric Co., plans to build a $34,000,000 station at Rowe, Massachusetts. The Rural Cooperative Power Association of Elk River, Minnesota has a proposal under consideration by the AEC. American & Foreign Power has announced that it will build three small power plants in Latin America.

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Utah Construction To Build Synthetic Scheelite Plant for Korea Tungsten Co.

Korea Tungsten Mining Company has announced that on 22 December 1955 the company signed a contract with the Utah Construction Company for the design, erection, and operational supervision of a new "synthetic scheelite" plant. This new plant will treat low-grade flotation and table concentrates from the Sang Dong tungsten mine. It will take about 15 months to build the $2,500,000 plant and place it in operation.

Once the plant is producing, the overall recovery of tungsten will be increased very substantially. A typical assay of the high-grade concentrate now produced is 65.65 percent WO_3, 1.24 Mo, 0.56 Bi, 0.03 Cu, 1.33 S, 2.56 Fe, 0.30 P, 0.02 Sn, 0.02 Sb, 0.07 Mn, with a trace of arsenic and lead. The synthetic scheelite from the new plant will have virtually no molybdenum, sulphur, bismuth, and phosphorus. Also, the synthetic scheelite will command a regular price on the world market in contrast to the recent sale of 65 percent plus WO_3 concentrate for only $18.00 a unit.

The new 80-ton-per-day plant will be built three miles below the company's 1,200-ton-per-day flotation-gravity concentrator at Yeoungwall, Kangwon Province, Republic of Korea shown in the accompanying picture. Ore from the adit

is hauled by battery locomotive to mill bins at upper left. The crushing plant and fine ore bins occupy the upper portion of mill. The grinding-classification section is in the long, low, light-colored roofed building near mill's center. Flotation section is immediately below, and filtering, drying, and packing in buildings beneath smokestack. Note dip (into mountain) of country rock at lower left. This is Cambrian mudstone and siltstones of the Myobong formation in which the six scheelite-powellite-bearing tactite beds are found. Since April 1955 Korea Tungsten has been stockpiling tungsten middlings assaying from 3.0 to 7.0 percent WO_3 in anticipation of the plant's erection.

Utah Construction previously had a contract to mechanize and modernize the underground mine and mill.

The formal contract was signed at 10:00 am December 22, 1955 in the office of the Ministry of Commerce and Industry, Seoul, Korea. Minister Il, Hwan Kim represented the Korean government and Arthur Kendall the Utah Construction Company. Korea Tungsten Company president, Ahn, Bong Ik and his staff witnessed the contract signing.

New Brunswick Developing As Major Mine Center

New Brunswick is rapidly developing into a major Canadian mine center with the recent announcement of two additional ore discoveries by Kennco Exploration (Canada) Ltd. and Texas Gulf Sulphur Company.

The Kennco discovery is about 20 miles south and west of the major lead-zinc deposits of American Metal Company located in 1954. Geology and mineralization of the Kennco property are similar, although geologically the belt does not tie in with former discoveries and may be termed a "new basin."

Kennco, a Kennecott Copper Corporation subsidiary, has 400 to 500 claims, and is proceeding with detailed ground surveys, and diamond drilling.

The Texas Gulf Sulphur discovery is a single ore body on a 39-claim group 10 miles west of American Metal. The firm is continuing to drill the area, and there are indications of large lead-zinc reserves. Texas Gulf operates in New Brunswick through a wholly owned subsidiary, Middle River Mines Ltd., which has 500 to 600 claim holdings to the north and east of the discovery.

Heath Steel Mines is the American Metal Company subsidiary working in New Brunswick. The No. 1 shaft is now down 450 feet and crosscutting has started to one ore zone about 200 feet away. A second shaft is being collared about two miles from No. 1, a third deposit is being readied for stripping, and a site has been cleared for a proposed mill. It is hoped to bring the property into production in about two years. Drilling indicates substantial tonnages of sulphide deposits containing lead, zinc, and copper.

Bancroft Copper Mines Development on Schedule

The production goal of 85,600 long tons of copper by the beginning of 1960 set by Bancroft Mines Ltd. for its properties in Northern Rhodesia will now involve an estimated expenditure of £19,750,000. This includes an additional £2,000,000 arising from revised estimates brought about by unexpectedly difficult development conditions, higher labor costs, increased costs of raw materials, and deepening of the No. 1 shaft. The poor bearing quality of the surface has also necessitated special attention to the design of the plant foundations.

In the No. 1 Shaft of the Kirila Bomwe South ore body, temporary pump stations have been connected with drainage holes drilled in the footwall towards the ore body, until the main pumps are installed in the shaft. Pumps have already been installed in one of the two ventilation shafts of the ore body with a capacity of 5,250,000 gallons a day. The ventilation winzes are now to be sunk vertically and well in the footwall to offset bad sinking ground, and pump stations will be cut at two levels with the pumps connected with drainage holes to be sunk from the stations well into the water-bearing beds. Additional drainage holes will be drilled at other points, and water-tight doors are being installed to protect the ventilation winzes and the various pumping stations, and at other points. The initial drainage program is to drain the ground to a point below the 400-foot level.

In sinking the No. 2 Shaft in the Konkola ore body, little water has been encountered. However, in a crosscut a sand-filled fissure was encountered and to overcome this, two parallel branch crosscuts are being advanced to a point short of the fissure, from which the loose ground will be cemented. Two ventilation shafts will serve operations in the ore body. The expanded production program calls for the opening of the Kirila Bomwe North ore body, which will be opened up from the No. 3 Shaft to be sunk in the footwall; ultimately, however, the ore will be transported by underground haulage and hoisted up the No. 1 Shaft, already mentioned. The difficulties being encountered are not expected to delay unduly the start of production as scheduled. The estimate of ore reserves remains unchanged—namely at 92,000,000 tons averaging 3.67 percent copper.

San Manuel Smelter Pours First Copper

Six months ahead of schedule, San Manuel Copper Corporation has placed its smelter in operation at San Manuel, Arizona. By mid-year the $114,000,000 project should be in full production processing about 30,000 tons of ore daily to yield 70,000 tons of copper annually and 3,000 tons of molybdenum as a by-product.

The ore body is located in the Old Hat mining district of Pinal County. Two main shafts have been sunk to a depth of 1,643 feet, and more than 25,000 feet of drifting has been completed. It is estimated that 10,000,000 tons of 0.77 percent copper ore can be mined annually for the next 50 years. The molybdenum byproduct will also be produced.

The company has a $94,000,000 loan from the government which must be repaid at five percent interest. Under an agreement with the DMPA, the United States government may purchase or be required to purchase all or substantially all of the firm's first 5½ years' estimated output at a guaranteed price of 24¢ per pound. With copper now selling at 43¢, it can be assumed that most of the concentrate will be sold to private industry.

Iraq Desert Yields Phosphate Deposits

Large deposits of phosphate have been discovered in Iraq's desert area near the trans-desert road between Rutbah and Ramadi. Intermittently, the deposit extends for some 60 kilometers, is on an average of 3 to 4 kilometers wide, and depth is very variable. Preliminary results indicate high-grade material and detailed investigations are now going on.

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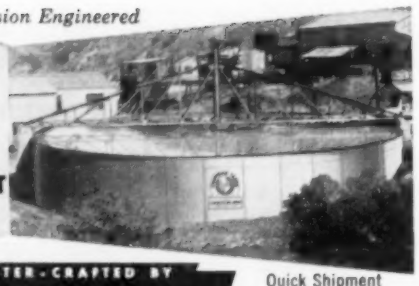

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Total U. S. Mineral Output Registers a New All-Time High of $15,800,000,000 In 1955

Paced by sharp increases in copper and iron ore production, the nation's metal mining industry staged a healthy upswing in 1955, according to a summary released by the U. S. Bureau of Mines. The total value of the United States mineral output, including fuels, metals, and nonmetallics, reached an all-time high of $15,800,000,000 during the past year.

Metals accounted for $2,010,000,000, non-metals $2,866,000,000, and the fuels category, which consists of coal, carbon dioxide, natural gas and petroleum, registered $10,892,000,000. The metals showed the biggest gain over 1954 production figures with a 35 percent increase in value of output. Non-metallic minerals exhibited an 8 percent jump in the same period.

The major factor contributing to the strong surge of metal mining was the expanded production of copper and iron ore in that order. In addition, zinc, lead, tungsten, and manganese ores also recorded a substantial gain in value.

The most significant development of the year was that 20 percent more recoverable copper was mined in 1955 than in 1954 despite prolonged strikes which crippled the industry in July and August. To meet the demands of a record-breaking steel industry, iron ore tonnage shot up 40 percent over 1954. Shipments to the government stockpile sent domestic production of tungsten and chromite upward to record levels, and manganese shipments increased substantially to a post-war high. Domestic mine output of lead and zinc rose over 1954, but was still well below the annual average of the last four decades.

Rare and precious metals continued to grow in importance and production increased for such metals as columbium, tantalum, gold, silver, and the rare earths.

Production peaks were established for ilmenite, titanium sponge, tungsten, chromite, cobalt, molybdenum and aluminum. Domestic output of zirconium and hafnium dropped when the Bureau of Mines stopped producing these metals for the United States Atomic Energy Commission, but their availability from private industry was greater than ever before.

Fertilizer raw materials hit another all-time high in 1955, according to the Bureau. Phosphate rock production, owing to a lengthy strike in Florida, increased only slightly, but potash production rose about seven percent to an estimated 2,100,000 short tons valued at $78,000,000.

Production of crude gypsum in the United States jumped to more than 10,000,000 tons, a new record. Two major gypsum mines and plants went into operation in the first commercial development of deposits near Shoals, Indiana. Plans for further expansion of gypsum-products plant capacity in the near future were announced by several companies.

Government purchases sparked increases in domestic production of muscovite block, film, and hand cobbed mica of strategic qualities. The quantity of newly mined non-strategic mica slowed, however.

The following is a summary of important highlights in the mining economy of the nation.

COPPER prices last reached the highest peak since 1865. Mine production is estimated at just over 1,000,000 tons for the first time since World War II.

High foreign prices were largely responsible for a 10 percent decrease in imports during the first nine months of the year.

LEAD: Output of refined lead was estimated at 484,000 tons or 8,000 tons less than in 1954. Domestic mine output increased to 332,000 tons compared with 319,000 tons in 1954. Pricewise, the metal rose from 15 to 15½ cents a pound during the year, then reached 16½ cents in January 1956 before leveling at 16 cents.

ZINC: 1955 mine production will approximate 508,000 tons, about nine percent above the 1954 figure of 465,000 tons. Slab zinc production during 1955 was the highest in history at 1,020,000 tons.

CADMIUM: Output was near 9,780,000 pounds which was very close to the 1953 record year.

MERCURY: Domestic mine production was virtually unchanged from the 1954 position of 18,543 flasks.

BAUXITE: Domestic mine production was down slightly from the record 1954 level. The drop reflected reduced stockpiling requirements rather than lessened consumption. The bauxite import pattern continued to change significantly. Imports from Jamaica have increased every year since 1952, and last year nearly equalled the amount supplied by Surinam.

ALUMINUM: Output increased 100,000 tons over the previous high registered in 1954 to 1,560,000 tons. Despite the increase, demand was large and some segments of the consuming industry reported difficulties in obtaining the metal. Demand was so great that of the 400,000 tons scheduled for the national stockpile, only 125,000 tons were acquired. The price rose 2.2 cents during the year to 24.4 cents per pound.

ILMENITE production expanded during the year to 573,000 tons, an increase of 25,600 tons over the previous peak established in 1954.

TITANIUM SPONGE was estimated at a record 7,500 tons compared to 1954's 5,370 tons.

TUNGSTEN: Output picked up during the year and the present government purchase program should be completed by mid-1956. Production during 1955 was estimated to be the highest in history at 15,000,000 pounds.

IRON ORE: Shipments of iron ores were 11,000,000 tons less than the record year 1953, but were 40 percent higher than 1954. Canada and Venezuela were the chief foreign sources for imports. In Minnesota, construction of taconite processing plants and dock facilities on the north shore of Lake Superior progressed rapidly. The first shipments of taconite pellets were made from a 3,750,000-ton plant recently constructed at Silver Bay by Reserve Mining Company. New dock facilities at Taconite Harbor and a 7,500,000-ton processing plant at Aurora were well underway.

African Metals To Explore Transvaal Copper Property

Northern Transvaal (Messina) Copper Exploration Ltd. has entered into an agreement with African Metals Corporation Ltd., under which African Metals will conduct a preliminary investigation of Northern Transvaal Copper's property in the vicinity of Messina, Northern Transvaal, Union of South Africa.

Some time ago Northern Transvaal (Messina) suspended exploration of its directly and indirectly owned copper deposits covering about 3,195 base metal claims. Its cash resources had been utilized in shaft sinking and underground exploration. Results at that time were encouraging.

Under this new agreement, African Metals has until January 31, 1956 for the preliminary work, and an option to extend the agreement for five years. It also has an option to purchase all of the assets for £250,000 in cash, or £125,000 in cash supplemented by a royalty on each ton of copper or ore mined. The agreement is subject to three months' notice of termination by African Metals.

AEC Opens Ore-Buying Station at Tuba City

A new uranium ore-buying station and sampling plant has been opened by the U.S. Atomic Energy Commission at Tuba City, Arizona, on the Navajo Indian Reservation about 75 miles north of Flagstaff.

The plant was constructed and is owned by Rare Metals Corporation of America, and is leased to the AEC pending completion of the uranium processing mill being erected on the same site by Rare Metals. After completion of the uranium mill, scheduled for later this year, Rare Metals will take over the sampling plant to purchase ores for its own account.

Carnotite-type or roscoelite-type ores that meet the specifications of Domestic Uranium Program Circular 5, Revised, that are offered for sale will be purchased in accordance with the provisions of the circular. Those carnotite-type or roscoelite-type ores that would meet the conditions of Circular 5, Revised, except that they contain lime ($CaCO_3$) in excess of six percent, may be purchased under special contracts with individual producers, following the price schedule of Circular 5, Revised, but with appropriate deductions to compensate for the higher treatment cost of such ores.

European Group Studies African Aluminum Plans

A newly formed European company is now studying the technical and financial details of a project designed to establish an alumina and aluminum industry in French Africa. The firm, Societe Europeenne Pour l'Etude de l'Industrie de l'Aluminium en Afrique (Afral), has been set up by the French firms of Pechiney and Ugine, Italy's Montecatini, Germany's Vereinigte Aluminium Werke, and the Swiss company Societe Anonyme Pour l'Industrie de l'Aluminium.

The five companies recently formed another firm to study power supplies in the area. Societe Civile d'Etude Hydroeletriques du Konkoure et du Kouilou. The French government's Caisse Centrale de la France et d'Outremer holds 55 percent interest in this group, while only private interests are represented in Afral. The project anticipates construction of adequate power plants to permit aluminum output of 500,000 to 600,000 tons per year.

REPUBLIC OF KOREA—The government has instructed Ambassador Y. C. Yang in Washington to sign formally the ROK-US agreement for cooperation concerning civil uses of atomic energy. The agreement was initialed by ROK and United States officials in Washington last July, and has been endorsed by President Syngman Rhee and the House of Representatives. The agreement provides for lease to Korea of six kilograms of uranium enriched in U-235 isotopes, and technical assistance in construction and operation of a research reactor.

MALAYA—Fire broke out 700 feet underground in the *Pahang Consolidated* tin mine at Sungei Lembing, the deepest mine in Malaya. (Some of the shafts are 1,300 feet deep.) The shaft has been sealed until the fire burns itself out. Work is proceeding normally elsewhere in the mine and production should return to normal soon.

BURMA—Mining and milling are expected to start soon at the *Mawchi Mines Ltd.* property. First operations will be on a small scale and will be increased as additional labor becomes available in the area. Burmese military forces are still at Mawchi and with the help of the police the company has been able to maintain regular transportation to and from the mine. Since the question of finding adequate labor is governed by so many unpredictable factors, orders have been placed for mechanical equipment to increase efficiency and output. Mawchi's pre-war production was almost 6,000 tons of tin-wolframite concentrates annually, and although it can hardly attain such a figure in the foreseeable future, it shows the mine's inherent possibilities. The company is currently custom milling.

REPUBLIC OF KOREA—A plan has been agreed upon by the Korean government and the United Nations Korean Reconstruction Agency (UNKRA) for the erection of a complete grinding plant at the *Oriental* talc mine near Chungju. This would enable the company to export ground talc instead of raw talc as at present, and would double the foreign-exchange earnings of the mine in the Chungchong Pukdo Province. UNKRA has allocated $150,000 for materials, equipment, supplies, and technical assistance needed for the plant.

TURKEY—To date, no company has taken over development of the Uludag scheelite deposit for which the *Eti Bank* wants 3,000,000 Turkish lira, although negotiations with some European company are reportedly under way. Some ore has been mined, but applications to export the ore have been turned so far by the Turkish Ministry of Economic Affairs on the ground that the ore is a strategic raw material.

MALAYA—*Renong Tin Dredging Company Ltd.* reports that the remainder of the high yielding *Old Town* property at Rasa was worked out by No. 2 dredge during the past year, and further high recoveries from this area are unlikely. The rehabilitation of No. 3 dredge has proved to be a profitable venture. Results are expected to improve at the *Jinjang* property where No. 1 dredge was re-erected after a move from Gombak.

BURMA — *Burma Corporation*, now jointly owned by *Burma Mines Ltd.* and the Burmese government, has made great strides in rehabilitating the property and plant after the ravages of war. Although the current output has not yet reached the pre-war level, the mine is well on the way to becoming again one of the world's largest producers of silver, and an important producer of lead, and zinc. During the year ended June 30, 1955, the mine's output was 11,515 tons of refined lead, just over 1,000,000 ounces of silver, and 13,000 tons of zinc concentrate from an ore output of 102,000 tons.

TURKEY—The chrome ore reserves of the Guleman and Sori region, held by the *Eti Bank*, have been calculated at 700,000 tons. The reserves of the *Divrigi* iron ore deposits, also held by Eti Bank, have been estimated at 28,000,000 tons of 60 to 66 percent Fe.

MALAYA—*Rahman Hydraulic Tin Ltd.* has conducted a series of tests on run-of-mine ore in a small pilot plant for a direct comparison of pilot plant and mill recoveries. It was proven that with the modern machinery in the pilot plant recovery increased greatly, and it can therefore be assumed that when the present reduction and treatment plant is modified for a peak load of 100 tons per hour, production will be increased about 25 percent. Overall cost of modernizing the plant is about $175,000, and it is hoped that it will be in operation by late 1956.

TURKEY—The first discovery of wolframite-quartz veins has been made in Anatolia. Until now, tungsten has been known only as scheelite in Turkey. The discovery was made in a district between Ankara and Eskisehir. The vein lies near the chrome deposit of Kavak in metamorphous schist. The WO_3 content is uneconomical but it is considered a sign that the district is mineralized.

SCOTLAND—The *Siamese Tin Syndicate* is going ahead with construction of the treatment plant at Leadhills in the Lanarkshire area. J. H. Langford, president of the Cornish Institute of Engineers, is in charge of operations.

NORWAY—A/S *Aardal og Sunndal Verk* plans to expand its aluminum production facilities from 24,000 to 60,000 tons annually. This involves construction of a major hydroelectric power plant, with over-all cost of the project estimated at Kr. 394,500,000. A tentative agreement with the *Aluminum Company of America* would provide $20,000,000 with the loan to be repaid in aluminum ingots over a 10-year period, starting in January 1961.

AUSTRIA—The newly opened zinc processing plant of *Gailitz-Arnoldstein* is processing Italian zinc ore because Bleiberg Bergwerk Union's own zinc ore can be processed only after the plant has accomplished the "test run." Austrian zinc ore is still shipped to Belgium for processing and then re-shipped to Austria. After taking over the plant, the BBU plans to use the processing center's full 10,000-metric-ton capacity, because the *Vereinigte Oesterreichische Eisen und Stahlwerke (VOeEST)* is an important new quantity customer for zinc. By-products will include about 130 to 180 tons of lead and 14 to 19 tons of cadmium. The cadmium plant will start within a few months and will produce electrolytic cadmium of almost 100 percent purity.

SPAIN—*Union Espanola de Explosivos* has been authorized to enlarge its San Jeronimo plant at Seville to include the production of sulphuric acid and superphosphate. The acid plant will consist of two furnaces with a daily capacity of 50 tons of pyrite each. The superphosphate plant will consist of two groups for the grinding of phosphates, with a joint capacity of 16 tons hourly. Planned output

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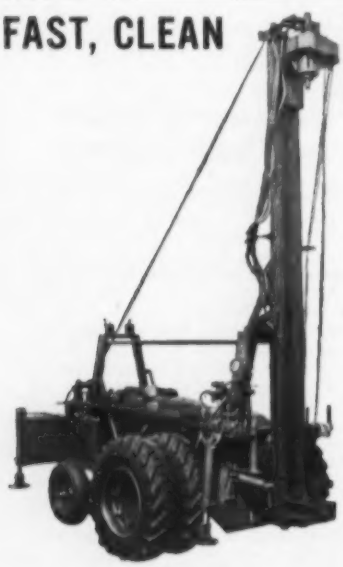

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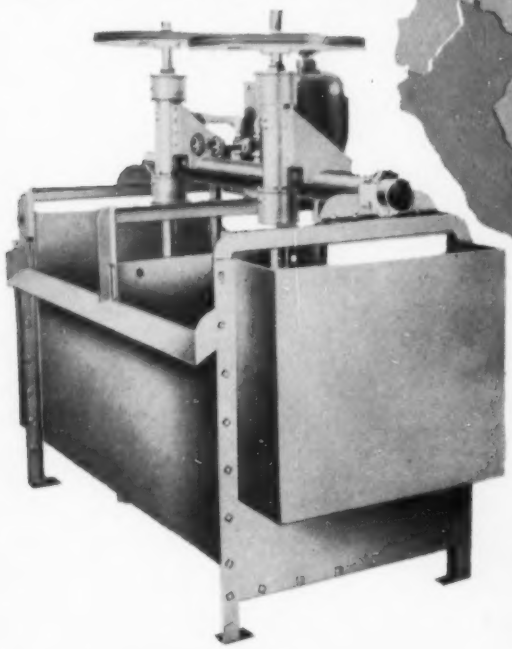

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EIRE—A Canadian firm already operating at Avoca in County Wicklow is presently considering development of existing copper mines at Beauparc in County Meath which have been closed for about 50 years. Preliminary surveys are to be made of all known copper deposits in Eire, and consideration given to reopening and developing them.

ITALY—The Ministry for Foreign Trade has authorized the National Sulphur Agency to export 50,000 tons of Sicilian sulphur to the U.S.S.R.

NORWAY—Important new ore discoveries have been made by *Hunting Geophysics Ltd.* operating on behalf of A/S *Titania*. Hunting Geophysics is one of the companies in the *Hunting Aerial Survey* group, and was awarded an aeromagnetic survey contract to cover some 300 square miles in southwest Norway in an attempt to locate ilmenite deposits. As a result of the survey, a drilling program has been undertaken which already has delineated over 100,000,000 tons of good quality ilmenite. The deposit has been named the *Tellnes*.

AUSTRIA—*Vereinigte Osterreichische Eisen und Stahlwerke* (*VOeEST*) (*United Austrian Iron and Steel Works*) at Linz has produced the 1,000,000th metric ton of steel by means of the Austrian developed "Oxygen Converter Method" since the beginning of production on January 5, 1953. VOeEST plans to install two more oxygen converters, each with a 30-metric-ton capacity, in 1956, thus enabling the plant to produce 1,000,000 metric tons of steel annually.

POLAND—Discovery of extensive sulphur deposits near Tsrnobrzeg east of Krakow has been reported. Mining and processing of the deposit is to be started soon under the next Five Year Plan which begins in 1956.

U.S.S.R.—The Russian paper *Komsomol Pravda* reports production statistics for steel in Communist Poland, Czechoslovakia, Hungary, and Rumania in 1954. Until recently statistics were given in percentages, and rarely in actual quantity. According to the paper, Poland's steel output was 4,100,000 tons in 1954, compared with 1,400,000 tons in 1938. In Czechoslovakia output in 1954 was 4,400,000 tons, compared with 2,300,000 in 1937. Hungary produced 1,491,000 tons in 1954 compared with 647,000 in 1938, and Rumania 700,000 tons compared with 300,000 in 1938.

ENGLAND—*Imperial Chemical Industries* will build a £2,000,000 titanium fabricating plant at Swansea with initial production scheduled for 1958. Plans for the new plant came as a result of increasing demand for titanium, especially from the aircraft industry. Two other plants are already in operation by I.C.I., a titanium sponge operation at Yorkshire, and a Birmingham plant which operates melting, forging, and other fabricating facilities. Some fabricating is also done in South Wales.

SPAIN—*Alumino y Aleaciones, S.A.* will erect an aluminum plant at Sabinanigo in the province of Huesca for the production of 99.9 percent aluminum and of semi-finished aluminum products. A new company is to be formed to operate the plant.

BULGARIA—The country's first lead-zinc processing plant was put into opera-

tion last September. The plant, equipped with Soviet machinery, is located near Krdjali.

POLAND—Dolomite deposits have been located near Lodz in the Leczyca district.

SCOTLAND—*Fraser and Chalmers Engineering Works*, a subsidiary of *General Electric Company*, has received an order from *Colvilles, Ltd.* for an ore handling, storage, and loading plant to be installed at *General Terminus Quay* on the River Clyde. A double line of conveyors, each with a capacity of 1,100 tons per hour, run from the quayside and storage bunkers at the adjacent rail sidings. The bunkers have a capacity of 14,000 tons and will discharge ore simultaneously into four lines of 14 cars, each with a 35-ton capacity.

SPAIN—Considerable trade has been reported between Spain and members of the Soviet bloc of nations. Poland bought 300,000 tons of ore from Spain in 1954-55 in return for 200,000 tons of coal. The ore came from the *Rif* mines and was shipped to Eastern Silesia.

ENGLAND—An agreement has been signed with Belgium to continue supplying Britain with uranium from the Belgian Congo in return for help to Belgium in its atomic energy program. The agreement is parallel to the 10-year pact signed last year by the United States and Belgium, granting the U.S. and Britain the right to buy up to 90 percent of the Congo's uranium production for the next two years.

RUMANIA—Metallurgists have reportedly turned out a substitute alloy to eliminate the need for bronze imports. The new material, "Zinal," consists of zinc and aluminum.

YUGOSLAVIA—Talks have been going on in Belgrade with representatives of the United States government concerning expansion of a copper mine at Majdanpek, and building of iron works in Skoplje and an aluminum factory. Yugoslavia is interested in securing foreign capital for the financing of new iron and steel works and non-ferrous metal plants. Vice President S. Yukmanovic-Tempo has indicated that no further expansion will be conducted along this line unless investment credits are obtained from abroad.

WALES—Plans to reopen several old gold mines near Dolfelly and rework certain tailing dumps have been abandoned.

EIRE—Canadian interests are reportedly seeking Eire government facilities for development of mineral deposits in Western Cork. The company wants to develop existing copper deposits in the *Beara Peninsula* area. A private survey taken last year reported about 7,000,000 tons of ore in reserve.

HUNGARY—An ore dressing plant is now under construction at Rudabanya near the Czechoslovakian border to process the low-grade siderite found in the area. The plant will be completed in 1958 and is expected to raise Hungarian iron ore production 250 percent. Equipment is being provided by the *Ernst Thalmann Works*, Magdeburg, Eastern Germany.

CORNWALL—*South Crofty, Ltd.* is modernizing and expanding its gravity concentrating plant at Cambourne. An HMS plant may be installed for preconcentration before the rebuilt table concentration section of the process.

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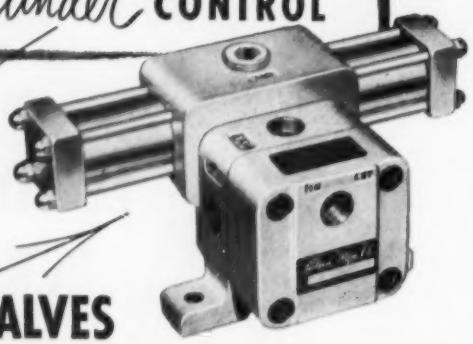

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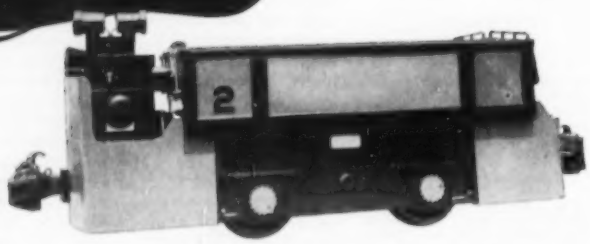

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INTERNATIONAL

NORWAY—Parliament is considering a recommendation of the *North Norway Development Fund* to loan Kr. 12,500,000 for expansion of pyrite mining at the *Bleikvassli* and *Mo* fields in the Norland province. Combined ore production would be increased from 60,000 to 160,000 tons per year. Part of the loan would pay for the ore dressing plant now under construction at Bleikvassli, which will serve both mines. If Parliament approves, the expansion program should be finished in 1958.

SWEDEN—Extensive low-grade uranium deposits have been reported in Orebro County where prospecting is being carried out by *Svenska Skifferolje Company*.

CORNWALL—*Geevor Tin Mines Ltd.* report that the Humphreys spiral plant, which was installed several months ago to scavenge table tailing, has been operating so satisfactorily that the firm has decided to add additional spirals to the operation.

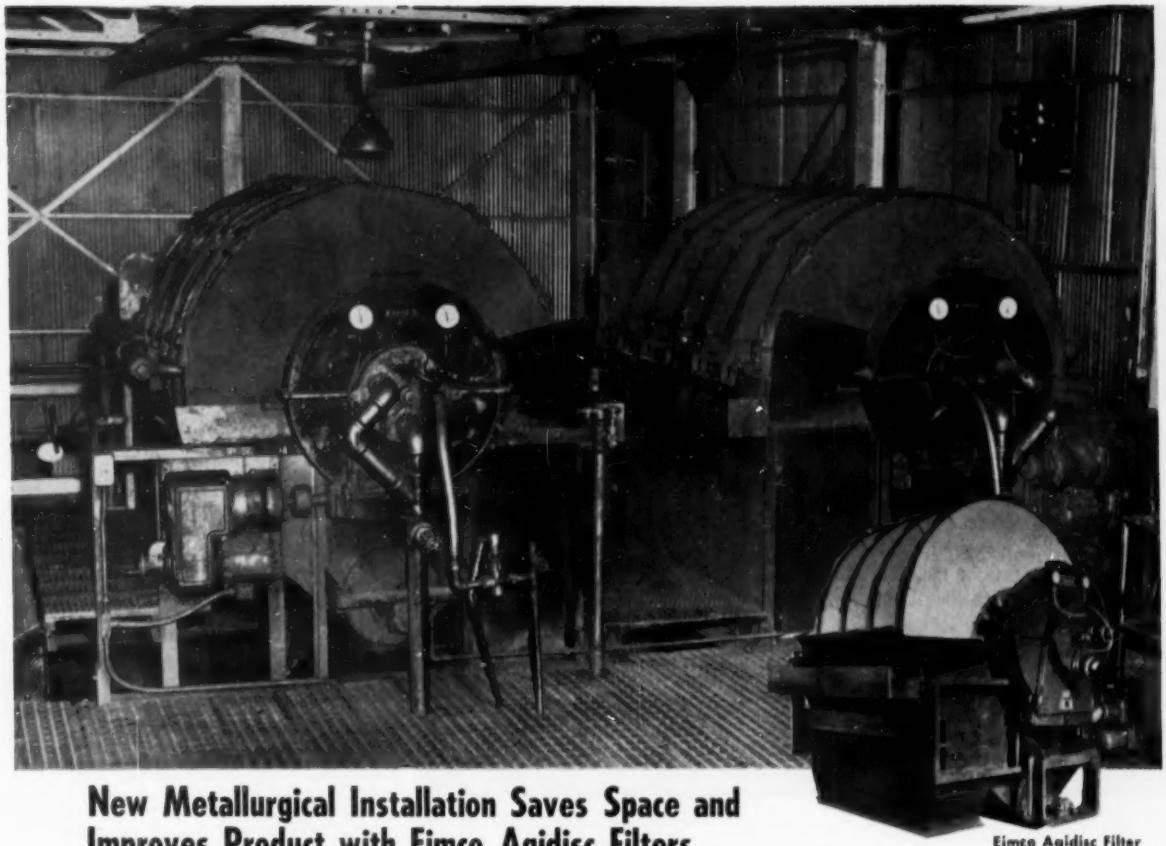
NORWAY—Assays by the *Norwegian Geological Laboratory* in Oslo have indicated an average U_3O_8 content of 0.5 percent in deposits recently reported in the northern part of Norway. The area is quite inaccessible, and extent of the deposits is not yet known.

ITALY—The government is reportedly considering a program of iron mining on the island of Sardinia. Extensive iron deposits have been known to exist in the area, but the high silicon content and difficulties of transportation have prevented their exploitation.

BOLIVIA—The British firm of *Williams Harvey*, a subsidiary of *Consolidated Tin Ltd.*, reportedly has signed a five-year contract with the *Amalgamated Bolivian Tin Group* for the purchase of 50 percent of Bolivian tin output for the next five years, starting in January 1956. The Amalgamated group was set up by the government when the *Patino* mines were nationalized in 1952.

VENEZUELA—The old copper mines of *Aroa* in Yaracuy state are being reopened after 19 years of inactivity. They were operated between 1909 and 1936 by the *South American Copper Syndicate Ltd.*, a British company, which has since transferred the mines and all installations to *C. A. La Providencia*, a Venezuelan firm. The mines will be developed for sulphur contained in the copper, and iron ores, as well as these ores themselves. An output of some 30,000 tons per year is expected. Other copper deposits, mainly sulphides and carbonates, are known to exist in Aragua, Guarico, Tachira, Lara, Sucre, and Miranda states.

MEXICO—*Las Encinas, S.A.*, subsidiary of *Hojalata y Lamina*, has obtained a concession on 10 iron ore deposits south of Pihuamo, state of Jalisco. The company plans to produce about 300 tons a day from the deposits nearest the rail shipping point, while those further away will be developed later. The ore is expected to assay over 60 percent iron with a low sulphur and phosphorus content.



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New Metallurgical Installation Saves Space and Improves Product with Eimco Agidisc Filters

The photo above shows an installation of two 6' diameter by 5 disc Eimco Agidisc Filters in their operating position in a new metallurgical concentrating plant.

These filters were installed as a result of the owner company and Eimco cooperation in a joint effort to improve the operation of the filter station at this plant and reduce moistures with the most economical equipment.

After the installation had been operating for six months the following data was made available.

		PREVIOUS EQUIPMENT	NEW EIMCO FILTERS
1.	Concentrate handled	350,000 lbs./24 hrs.	350,000 lbs./24 hrs.
2.	Labor required	1 man full time	1 man part time
3.	Attention required	Constant inspection	Periodical inspection every 6-8 hrs.
4.	Operating Capacity	Full load—no capacity for additional tonnage	½-¾ load—capacity for 33% to 100% additional tonnage
5.	Equipment	4—Drum filters (not Eimco)	2—6' dia. x 5 disc Eimco Agidiscs
6.	Filter area	621 sq. ft.	500 sq. ft.
7.	Floor Space occupied	416 sq. ft. filters only	189 sq. ft. filters only
8.	Cake Moisture	20%—21%	14%—15%
9.	% Moisture reduction over previous method		33%
10.	Filter rate increase over previous method		more than 15%

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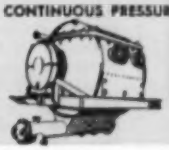

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PERU—*Cerro de Pasco Corporation* is presently mining at an annual rate of 750,000 tons of copper ore and 750,000 tons of lead-zinc ore. Its development program includes additional milling capacity at *Paragsha* near the Cerro de Pasco mine; construction of electrolytic and electrothermic zinc plants; extension of the existing Malpaso power plant; and addition of the hydroelectric power plant with an installed capacity of 65,000 kilowatts on the Paucartambo River. When the zinc development program is in full operation, the daily slab zinc production will be in excess of 200 tons daily.

BRAZIL—The president of the Japanese steel plant *Tokushu Seiko* in Tokyo, Yonetaro Ishihara, reports that his company is interested in building a steel plant in Sao Paulo, Brazil. This plant would produce special steels for the Latin American industries. Mr. Ishihara is presently in contact with the Banco da America do Sul, controlled by Japanese bankers. Part of the capital for the project would come from Japanese people living in Brazil.

BOLIVIA—Expansion of the Tasna and Chorolque tin mills has been completed which will mean increased overall tin production for the *Corporacion Minera de Bolivia* this year. New sink and float plants are being installed at the *San Jose* lead mine and at the *Oploca* property, while the *Colquiri* tin mine is increasing the capacity of its sink and float plant. These plants will probably go into production sometime this year. Also new bismuth ore dressing plants will be constructed at the Caracoles and Chorolque sections during this year.

VENEZUELA — *Venezuelan Sulphur Corporation of America* which holds concessions near the summit of the coast range about 10 miles south of Carupano, state of Sucre, anticipates start of production this year at a rate of 75,000 to 100,000 tons per year.

CHILE— The Export-Import Bank is considering loans to two important nitrate producers in Chile—*Cia. Salitera Anglo-Lautaro* and *Tarapaca & Antofagasta Nitrat Co.*, both of which plan expansion programs.

MEXICO—Manganese ore from the *Guadalupana* mine is being up-graded in a small mill near Magdalena, Sonora, set up by Jack Borevitz of Douglas, Arizona. Ore averaging approximately 50 percent is being marketed to United States industry through the port of Nogales, Arizona. Mr. Borevitz formerly operated *La Montosa* mine, near Moctezuma, and a mill at Agua Prieta.

BRITISH GUIANA—The *Caribbean Metals Corporation* has been formed to take over a gold prospect of *International Mining and Development Corporation*. An active exploration program is planned on the 42,700 acres.

VENEZUELA—*Compania Meridional de Minas S.A.*, a subsidiary of *International Nickel Corporation*, is expected to undertake development of deposits in Miranda and Aragua states shortly. Studies have been made on a method applicable to low-grade nickel ore such as found in this area southeast and southwest of Lake Valencia on the coastal range.

MEXICO—The increase in mining exports has prompted the Navy Department to modify plans for the modern ore wharf being erected at Tampico by

the Stevedores Union. The pier will be made 500 feet longer, bringing total length to 850 feet, to allow ample room for handling ore shipments and ore carrying vessels. The larger wharf will cost 6,000,000 pesos ($480,000) more, or a total of 18,000,000 pesos ($1,440,000). Steel is being provided by *Altos Hornos de Mexico, S.A.* operated by the government at Monclova, Coahuila.

SURINAM—*Dutch Guiana Minerals Corporation* has been formed to take over a 50,000-acre mercury concession of *International Mining and Development Corporation* in the Tempati River area. Work has started in clearing out old trails and old workings; a base camp is under construction; and a geologist will make a preliminary survey of the area.

BRAZIL—According to the Department of Mineral Production, a rich and large deposit of talc has been discovered in the area of Ponta Grossa, state of Parana. Though the talc cannot compete with others of foreign origin, it is reported to be of good quality.

CUBA—Chrome ore mined in the province of Camaguay reportedly has been shipped to the United States through the port of Charleston, South Carolina. The Norwegian freighter Mafalda is said to have carried 33,000 tons of the ore for the *Pittsburgh Metallurgical Company*. Large-scale imports reportedly will now get under way.

BOLIVIA—James M. Birkbeck and A. F. Velho, representatives of *Ventures Limited*, have been conferring with the Minister of Mines, Mario Torres Calleja, concerning their company's desire to take charge of development of the *Matilde* dinc mines. Also said to be interested in the deposit are the *National Lead Company*, *O'Neil Company*, the *Krupp* firm, and a Japanese firm.

ARGENTINA—Manganese deposits in Ojo de Agua (Santiago del Estero) reportedly are supplying about 2,000 tons per month, which could be increased if the existing plants in the area were to be fully mechanized and expanded. One of the most important plants in the area now is that of the *Minera Santiaguena S.A.*

MEXICO—Enrique Padilla, representing the *Aztec Minerals* of New York, will develop iron deposits located at Huatulco in the state of Oazaca. The deposit is estimated to contain 30,000,000 metric tons of magnetite. A plant will also be installed.

UNION OF SOUTH AFRICA—*South African Manganese Ltd.* has continued its geophysical and geological exploration in the Kuruman district. One of the recently acquired manganese properties has been opened up and suitable ore is being supplied to the associated *African Metals Corporation*. A second recently acquired property may also soon be opened up; prospecting and drilling have disclosed large ore bodies suitable for the domestic and export markets. The several new properties acquired in the area have materially extended the life of the company's operations. However, sales contracts remain limited to rail transport capacities available. The company urges closer attention to truck facilities by the Railway Administration, which has advised that little improvement can be expected before the end of 1957.

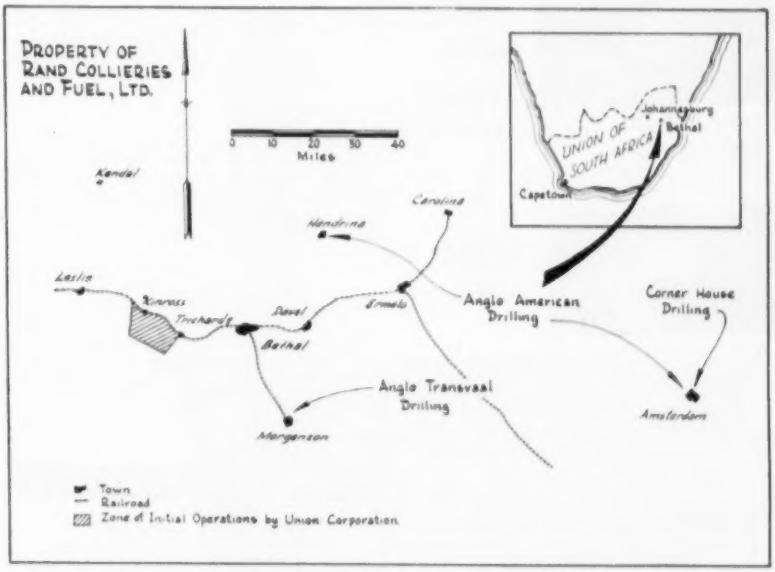
NIGERIA—*Amari Mines Ltd.* has renewed its lode mining lease on the *Kontagora* property for a period of 21 years, and the management has decided to engage in intensive exploration and development work to prove the theory that the four known lodes of cassiterite carrying dikes converge to form a "mother lode." To start with, an adit will be driven along the face of the lode which is now being worked in the open-cast section of the property. In order to deal with the anticipated increase in tonnage, a crushing plant with a capacity of 1,200 tons a month has been purchased.

FEDERATION OF RHODESIA & NYASALAND—The *African American Gold and Mineral Corporation Ltd.* is reconditioning old copper workings west of Que Que in Southern Rhodesia with the intention of investigating the deposit.

UNION OF SOUTH AFRICA—Ore production at the old *Mutue Fides* tin mine has been started by *Associated Ore and Metal Corporation Ltd.* and the output of tin concentrates from the pilot plant now under construction is expected shortly. An associated company—*Associated Asbestos*—is to resume production of blue asbestos from mines already developed and equipped for production. Additional development by *Krantzberg Mines Ltd.* is now being reflected in increased output of tungsten concentrates, for which a considerably higher demand is being experienced.

SIERRA LEONE—*British Titan Products Co. Ltd.* is sending a group of experts to Sierra Leone to investigate the possibility of economic extraction of titaniferous minerals. The party will be led by Dr. G. I. Higson, and will include Professor H. Longchamblon, a French professor of geology, two representatives of the *Columbia Southern Chemical Corporation of America*, and J. Blumenfeld, president of the *Mulhouse and Thann Chemical Company*. Preliminary investigations have been made in the Bonthe and Moyamba districts, but a statement approved by Dr. J. Joice who found the mineral indications, emphasized that even if investigations prove encouraging, it will be several years before active mining operations can begin.

FEDERATION OF RHODESIA & NYASALAND—*Consolidated Gold Fields of South Africa Ltd.* is to absorb the *Gold Fields Rhodesian Development Company Ltd.*, thereby consolidating its mining company shareholdings which are mainly in gold, platinum, and base metal companies. This Rhodesian associate is



Uranium-Gold Mine Development Starts at Bethal

Shaft sinking should soon be underway in the Bethal area of the Union of South Africa. Initial shafts will be sunk by the Union Corporation, Ltd. south of and between the cities of Kinross and Trichardt (See map above). Construction is already underway on housing, mine surface buildings, and mine plant foundations. There is a good possibility that as many as five uranium-gold mines may be developed. Another area, 10 miles to the north, is one to watch for the establishment of other mines by Rand Collieries and Fuel Ltd. Interest in the area started in 1953 after geological studies indicated that the Kimberley Reef might underlie large parts of the area. This is the main uranium-bearing reef of the Far East Rand section of the gold-uranium reefs of the Witwatersrand. Following geologic study, the Union Corporation carried out an extensive gravimetric survey and followed it with a deep diamond drilling program. Other major mining companies have large holdings in the area, and Anglo Transvaal Consolidated Investment Company, Ltd., the Corner House group (Central Mining Rand Mines Limited), and the Anglo American Corporation of South Africa, Ltd. have drilled in the areas shown on the map. Uranium will may be the main metal (dollarwise) to be mined in the area with gold the byproduct, in contrast to the reverse on the Witwatersrand.

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not to be confused with the subsidiary exploration company which is participating in the exploration of the Mwinilunga concession of the *Rhodesian Selection* group. The Consolidated Gold Fields company is also participating with the *British South Africa Company* and the *Anglo American Corporation* in exploring other large areas in Northern Rhodesia, and is now about to start exploration in Nyasaland, especially for radioactive minerals. Jointly with *Colonial Development Corporation*, Gold Fields through the *Tangold Mining Company*, is developing the *Kiabakari* mine at which, it is reported, an Aerofall mill may be installed. Other prospects in East Africa are being actively examined.

UNION OF SOUTH AFRICA—*Venterspost Gold Mining Company Ltd.* has completed to its final depth the No. 1 Subvertical shaft which will serve the deeper levels of the Main and Ventersdorp Contact Reefs in the northeastern section, and is now sinking the No. 3 Subvertical shaft which will function similarly in the southwestern section. A faulted zone was disclosed in the final stages of sinking the No. 1 Subvertical shaft; and drilling and development are underway to determine its extent. Should the zone be shown to be the major West Rand fault, there may be an appreciable loss of economic ground in the section.

FRENCH WEST AFRICA—MIFERMA (*Societe des Mines de Fer de Mauretanie*) reports that its exploration program has confirmed positive iron ore reserves of 100,000,000 tons. Negotiations with Spanish authorities for a railroad through Rio de Oro are still going on and various plans for a major financing are being considered.

UNION OF SOUTH AFRICA—*Klerksdorp Consolidated Goldfields Ltd.* which has been authorized to test the uranium potential of its Dominion Reef has extended its underground exploration laterally from one of the three winzes being sunk. In one of the winzes, operations were temporarily retarded by a water-bearing fissure, from which the flow reached a peak of 10,000 gallons an hour, or the equivalent of 240,000 gallons a day. However, the company's most recent report indicates that the water is manageable and that results are more than encouraging.

REPUBLIC OF THE PHILIPPINES—*Samar Mining Company, Inc.* has started preliminary work and exploration on the Upper Sibuguey iron deposits in the town of Malangas, Zamboanga Province, northwestern Mindanao. The claims were recently acquired under lease from the Philippine government. These deposits were discovered several years ago, but were not developed. Samar is also working on several mineral prospects in Davao Province where a 250- to 350-ton mill at the company's *Masara* gold mine started operations in September 1955. The mining company owns and operates the *Camcueves* iron mine in General MacArthur, Samar Province, which has been in production since 1938.

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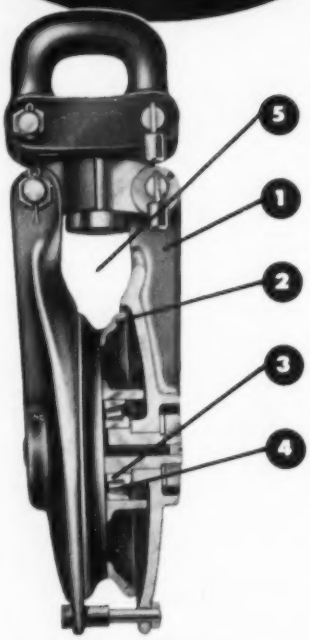

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QUEENSLAND – *Metals Exploration N.L.* reports discovery of an "important, high-grade" zinc-copper-cobalt prospect near Chillagoe, 120 miles west of Cairns. (A Government copper smelter was located at Chillagoe some years ago. It is in a well known mineralized area.) Metals Exploration has taken up leases covering 820 acres with options over 60 acres. The company has also claimed 160 acres at Comstock, 30 miles southeast of Cloncurry, where cobalt is said to be present in lode formation. Negotiations are in progress with Mining Corporation (Aust.) N.L. to develop the two areas.

NEW SOUTH WALES–*The Broken Hill Proprietary Company Ltd.* has signed a contract with a French syndicate to purchase 160,000 tons of New Caledonian iron ore annually. The ore is of medium grade and contains some nickel and chrome; it is considered suitable as a sweetener in furnace charges rather than a principal component. Trial shipments of ore have been smelted at Newcastle and Port Kembla, including a 16,000-ton shipment at B.H.P.'s subsidiary, Australian Iron and Steel Ltd., Port Kembla. A recent survey of Australia's iron ore reserves indicated 200 years' supply of high-grade materials. B.H.P. has a virtual monopoly over these and some authorities consider the New Caledonian move a protective one designed to forestall possible competitors. (Negotiations were conducted between B.H.P., *Etablissements Ballande* and *Societe Le Nickel.*)

REPUBLIC OF THE PHILIPPINES –*Palawan Quicksilver Mines Inc.* has announced the conclusion of a three-year contract for the sale of its production with the *Nomura Mining Company* of Japan. The quicksilver company is allowed to sell a part of its output to Philippine buyers. In spite of continuous heavy rains on Palawan Island, which makes it difficult to increase output and obtain maximum efficiency from the kiln, production at the mine is increasing. Production during October 1955 amounted to 10,936 pounds or 144 flasks of 76 pounds each, with an estimated value of Pesos 82,000. This output compares with the September total value of Pesos 49,500. First shipments of mercury concentrates in November were valued at Pesos 97,300 under a preliminary contract.

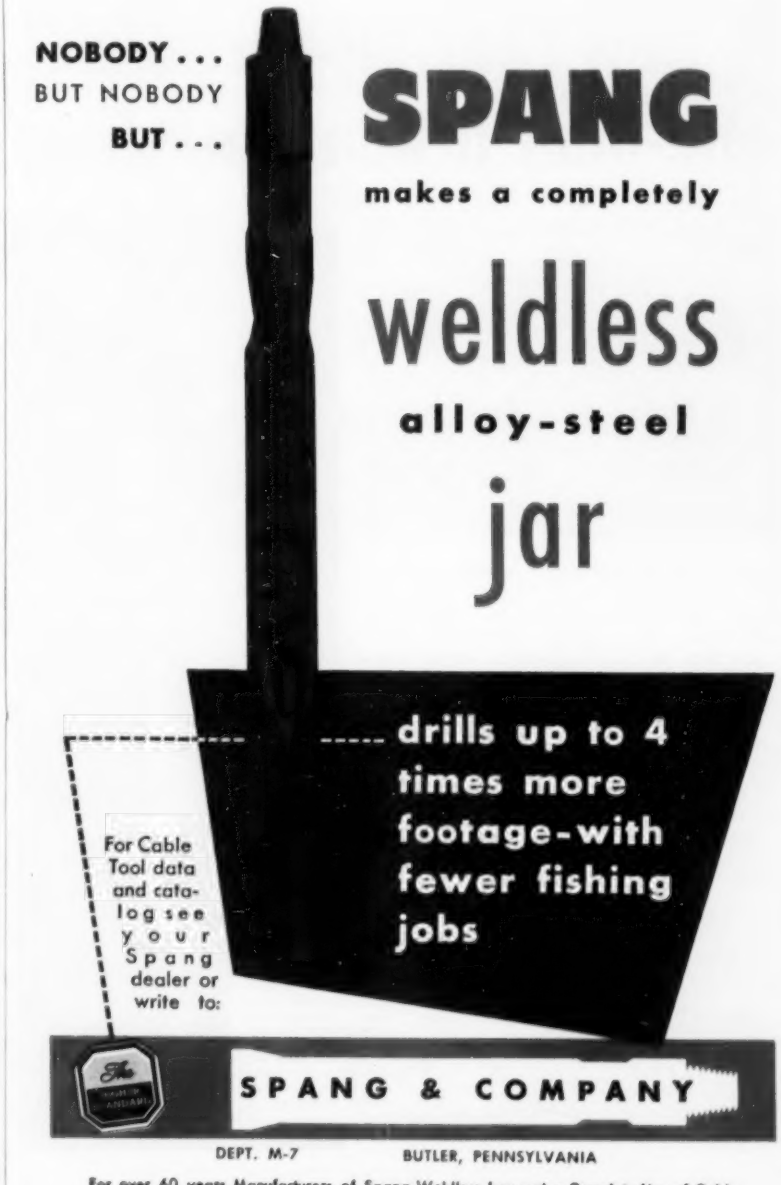
INDONESIA–In the limestone district of Patjitan in East Java, gypsum is found which is good material for the cement plant now under construction at Gresik near Surabaja. Mining is by primitive methods by the local population, and production is sold on the spot at low prices because of lack of transportation.

TASMANIA–For the first time, zinc production by the *Electrolytic Zinc Company of Australasia Ltd.* exceeded 100,000 tons in a working year, and this despite a reduction of 20 percent in power supply for two months. Actual output was 100,506 tons compared with 99,201 tons the previous year. The company's Rosebery mill treated 181,272 tons of ore for a recovery of 52,012 tons of zinc concentrates, 8,123 tons of lead concentrates, and 6,711 tons of copper-lead concentrates. Zinc concentrates are also obtained from Broken Hill, New South Wales, to supplement the Rosebery output. A fourth flash roaster and third contact acid unit are being installed at Risdon.

WESTERN AUSTRALIA – *Western Titanium N.L.* will install a plant costing approximately £A 500,000 near Bunbury. Beach sand deposits aggregating 8,000,000 tons are estimated to assay 40 percent heavy minerals (principally ilmenite, with some zircon, rutile, and monazite). Ilmenite presently used in Australia comes from India and is currently in short supply. Production is expected to begin in the Bunbury area around June; meanwhile, firm prices for rutile are being offered two years forward.

REPUBLIC OF THE PHILIPPINES–Directors of *Atlas Consolidated Mining & Development Corporation* have approved the sending of a trial shipment of pyrite to France to determine the economic feasibility of supplying the requirements of a large prospective buyer in that country. The Board is also considering proposals from machinery suppliers abroad for installation of the proposed acid and fertilizer plant which will utilize part of the byproduct pyrite from the copper flotation plant. It is tentatively estimated that the completion of the acid and fertilizer plant will be some time in 1958.

FIJI ISLANDS–In the year ended June 30, 1955, *Emperor Gold Mining Company Ltd.* at Vatkuola milled 156,048 tons for 63,003 ounces of gold. Head value was 8.9 dwts. and recovery 91.1 percent. The gold output is a record for the mine and is 2,500 ounces above the previous year's figure. Reduction in tonnage from *Loloma* mine leaves more mill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capacity for Emperor. An internal shaft is being sunk from No. 8 level and has reached a depth of 427 feet below No. 9. Several intersections of good ore have been met with during sinking operations.

WESTERN AUSTRALIA—*Central Norseman Gold Corporation N.L.* has commenced another inclined shaft on the Crown Reef. The Royal shaft is now at a depth of 1,632 feet (inclined) and the Regent shaft at 3,797 feet (inclined). Recent ore developments have varied in grade between 7 and 15⅝ dwts. of gold per ton.

INDONESIA—A representative of the German steel firm of *Marjatt* recently made an on-the-spot investigation of the possibility of establishing a blast furnace industry in the province of Sukabumi, West Java. An offer reportedly was made to the government to build blast furnaces as a joint project, with Indonesia supplying 40 percent of the capital and the German firm 60 percent. Indonesia would be permitted to pay off the 60-percent investment in six years by delivering each year 10 percent of the capital in the form of raw materials. For the first 10 years, management would be under German technical control, with German technicians training Indonesians to take over the operations. Ten percent of the profits would be reserved for the laborers since steel laborers would have to be trained first to build up a competent staff.

TASMANIA—*Renison Associated Tin Mines N.L.*, North Dundas, continues to be hampered by lack of large-scale capital but workings are now entering some of the richer lodes indicated over a year ago by diamond drilling. A 45 degree winze has been sunk 134 feet from the 1,975-foot level and, except for 20 feet, this has been in ore assaying more than 1 percent tin. The last 20 feet of the winze exceeding 2 percent tin. The winze bottom is 50 feet from where diamond drillhole S16 cut 50 feet of 2 percent ore and there seems little doubt that a considerable body of high-grade ore exists. Some drillhole results have shown over 6 percent tin in the past but it is not known whether there is any considerable body of such material. The Renison deposit is considered the largest lode tin deposit in Australia. Some authorities consider that it may repeat the history of *Mount Bischoff* (Tasmanian mine not far away; now inoperative) which, over 50 years ago, was the world's richest.

NEW SOUTH WALES—*Broken Hill South Ltd.* is pursuing an active policy of searching for new mines. It has acquired options over gold and copper deposits held by *New Occidental Gold Mines N.L.* at Cobar which are known to contain reasonable values of both gold and copper in depth. They were treated for many years by the New Occidental company before rising costs caused a cessation of operations. The New Occidental company had plans for deeper mining and spent considerable sums on drilling; lack of capital (£4,000,000 stated to be necessary) prevented New Occidental from proceeding with its deep mining plans and smelting at Cobar which was estimated to yield 10,000 to 15,000 tons of copper and 90,000 ounces of gold yearly. If initial investigations are promising, extensive exploratory work will be undertaken by Broken Hill South. The Broken Hill companies are making excellent profits from mining at Broken Hill, have large outside investments, and would have no difficulty in obtaining additional capital if necessary. Hence, although any program at Cobar will involve a great deal of development and expense, Broken Hill South will be in a position to exploit the ore bodies financially if an affirmative decision is made.

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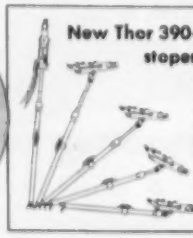

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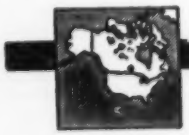

QUEBEC—*Pickands Mather & Co.* and *The Steel Company of Canada* have formed a new company—*Bristol Quebec Mining Company Ltd.*—to develop an open-pit iron ore property about 45 miles north of Ottawa. Large reserves of magnetite are present, reportedly sufficient to justify an annual output of 600,000 tons of concentrate. A concentrating plant and railway spur are under construction, with production scheduled to start in 1957.

BRITISH COLUMBIA—*Ottawa Silver Mining and Milling Company* is developing a discovery of high-grade silver ore in a raise at its mine near Slocan City. The find was made 200 feet above the No. 8 level. Ore from the raise is being stockpiled for spring shipment. Near Invermere, *Sheep Creek Gold Mines Ltd.* has made a new ore intersection in a

diamond drill hole downward from the No. 3 level of its *Mineral King* lead-zinc mine. The hole was in zinc-lead ore for 62 feet in a zone which was noncommercial in a horizontal hole drilled to it earlier from the same level. A new haulage tunnel 750 feet vertically below the No. 3 level has been advanced approximately 2,000 feet, leaving about 900 feet to go to the present objective.

ONTARIO—At the close of its mining season on November 4, *Cassiar Asbestos Corporation Ltd.* had 47,350 tons in the dry rock storage and 72,440 tons in the stockpile, sufficient to supply the mill until mining operations are resumed in June of this year. The grade is estimated at normal mine grade. Some additions and improvements were made in the mill circuit. The furnaces of the three rotary dryers were converted in December from coal to oil which has greatly improved control in the drying plant and has resulted in increased capacity and lower costs. The mill laboratory has been enlarged and is proving to be a vital factor in controlling quality and uniformity of the fiber. Major construction was completed during the summer on a tramline, but a strike at Skagway delayed delivery of equipment. Thus about two weeks' work during the spring season should complete installation.

SASKATCHEWAN—*Lake Cinch Mines* reports that its shaft is now bottomed at 548 feet for the time being. The first level is at 300 feet and the second at 500 feet. Most of the camp buildings have been completed. The first and second level crosscuts are expected to reach ore soon, and then drifting will begin to explore the ore body below the 500-foot level. Much of the firm's stock is held by *Violamac Mines* which has provided all of the funds to date.

BRITISH COLUMBIA—*United Estella Mines Ltd.* has encountered high-grade lead-zinc mineralization in a raise at its *Wasa* property, and is preparing to resume exploration work at its *Highland Valley* copper claims six miles north of Merritt. At Hazelton, *Silver Standard* is drifting in silver-gold-lead-zinc ore on the 1,500-foot elevation level. Stoping was continuing to build up reserves of broken ore.

ALASKA—Uranium drilling in the Ketchikan area started late in the fall and is expected to continue all winter. Deposits of uranium have been examined by the Department of Mines. In the Juneau area, two uranium ventures are underway south of the city, while north of the city, and west of Lynn Canal, another discovery has been reported. Because of the high cost of operations in Alaska, an ore is not considered of shipping grade unless it is 0.5 percent or more U_3O_8.

QUEBEC—*Selco Exploration*, the Canadian subsidiary of *Selection Trust Ltd.*, has entered into an agreement with *Thompson Grubstake 1955* (a Canadian prospecting syndicate) for the acquisition of 80 claims over a copper-nickel prospect near Lake Delahey in Pontiac County, Province of Quebec, held by Thompson. The consideration is $25,000 and 750,000 shares in a new company named *Lake Renzy Mines*. Selco also plans to explore by diamond drilling a 60-claim base metal group located 10 miles southwest of Snow Lake, Manitoba, and early drillings on the 21-claim copper group at Rowan Lake in the Lake area of Ken-

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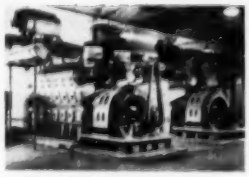

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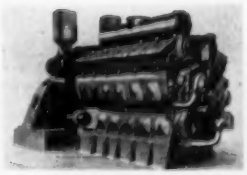

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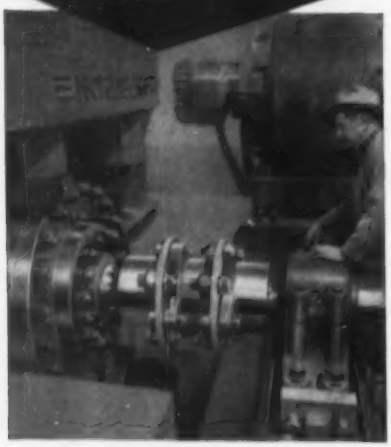

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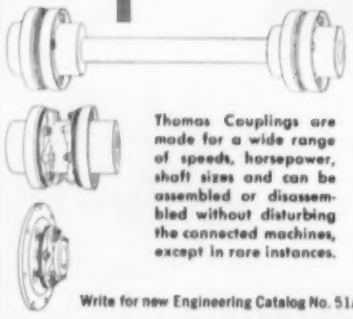

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THOMAS FLEXIBLE COUPLING CO.
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INTERNATIONAL

ora, Ontario. Still another drilling program is planned for the 32-claim base metal group in the Manitou area of Ontario.

BRITISH COLUMBIA—Development work has continued to disclose good ore bodies at the *Cariboo Gold Quartz Mining Company Ltd.* properties at Wells. An unexpected amount of ore was found in the Island Mountain area purchased from *Newmont Mining Corporation.* A $250,000 loan for purchase of the Newmont mine has been reduced to $100,000. Operations are being carried on with a full crew of approximately 300, following a serious shortage of competent miners during the spring and summer months.

QUEBEC—*Molybdenite Corporation of Canada* is increasing its mill capacity from 500 to 600 tons per day. A new molybdic oxide producing plant is currently under construction and should be completed shortly. Conversion of molybdenite concentrate into the molybdic oxide form is expected to add to the profit potential of the operation. Ore reserves are currently placed at two to three years supply, with a large portion of the company's holdings still unexplored.

ONTARIO—*Nickel Rim Mines Ltd.* expects to have its shaft sinking program to the four new levels completed by the end of this year. An estimated total of 33,728,000 pounds of nickel remain on the upper three levels of the mine now being worked, says the firm, and on the four new levels, the mine shaft will have penetrated only 1,200 feet, thereby merely "scratching the surface" of the mine.

NORTHWEST TERRITORIES—*Val d'Or Mineral Holdings Ltd.* has returned to the vicinity of the Arctic Circle for a mineral exploration program on some copper property at Bornite Lake, about 130 miles north of Port Radium. During the past season, an initial program got underway; this included some preliminary reconnaissance, limited amounts of diamond drilling, and claim staking. Gasoline and other supplies have been cached at Pt. Radium for the coming season when the company will undertake a more extensive program.

BRITISH COLUMBIA—*Skeena Silver Mines Ltd.* has optioned the *Divide Copper* group of 20 claims in the Highland Valley district. The property was last worked in 1914-1915. S. S. Parker is president. At Kitchener, the *Bon Ton* mine has been acquired by *Reward Uranium Company of Canada* for $50,000. The property was developed as a copper property. M. Henesael and F. E. Smith are the sellers.

ALASKA—*Climax Molybdenum Company* expects to resume drilling next spring on the *Ross-Adams* property on Prince of Wales Island, after winter weather closed down the property.

QUEBEC—*British Aluminum Company Ltd.* will build and operate, through a subsidiary, a 160,000-ton primary aluminum plant at Baie Comeau, about 200 miles east of Quebec. Actual construction of the $130,000,000 plant will begin early next spring. The first phase, costing $40,000,000, is scheduled for completion before the end of 1957, with the remaining three steps to be completed by 1965. The Quebec Hydroelectric Commission will supply 2,000,000-horsepower electric energy required for the operations.

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MINING WORLD
First in
Mining News

Lithium Corporation

Continued from page 58

heated to 250° C. Lithium sulphate is formed in the kiln by ion exchange.

Continuous Gravity Leach

In the next step, lithium sulphate is leached from the ore in a three-tank continuous gravity flow system. (In the plant near Minneapolis, this is a batch operation in wooden Pachuca tanks). Mechanical agitation is used to prevent particles from settling in the leaching tanks. Calcium carbonate is added to the leach slurry to neutralize excess sulphuric acid remaining on the ore particles after roasting.

Neutralized slurry is filtered from the gangue mud in a series of 8, Dorr-Oliver, 11½- by 18-foot, rotary vacuum filters. The cake is wasted at present but a research program is currently underway looking toward its eventual utilization.

Impurities Are Precipitated

In the purification system hydrated lime is added to the leach liquor, precipitating the small amount of contaminating magnesium as the hydroxide. Soda ash is next added to precipitate both the original calcium ions and those added with the lime as the insoluble calcium carbonate. Oliver "Seetland" leaf filters remove the precipitates, which are wasted.

The pH of the liquor is adjusted to neutral by the addition of sulphuric acid in the adjustment tanks before going to the evaporators. In the 5-effect evaporators, the liquor is concentrated and pumped to a second purification system where iron and aluminum are removed.

Soda ash is added to the concentrated solution of lithium sulphate to precipitate lithium carbonate. A continuous centrifuge separates the carbonate crystals from the mother liquor. The liquor from the centrifuge is further treated to remove by-product sodium sulphate which accumulates in the circuit.

Wet lithium carbonate crystals from the centrifuge go either to the dryer for the finished saleable product or to the lithium hydroxide unit.

How Lithium Hydroxide Is Made

Lithium hydroxide is the secondary compound currently produced at the plant. It is formed by reacting lime and lithium carbonate. The process consists essentially of three causticizing stages to form a weak lithium hydroxide solution. A three-stage counter current washing thickener is used for complete removal of the lithium hydroxide from the calcium carbonate that is formed in the reaction. The weak lithium hydroxide solution goes to a four-stage evaporator-crystallizer where lithium hydroxide monohydrate crystals are first produced. Finished lithium hydroxide crystals are recovered after further dissolving, filtering, recrystallizing, and centrifuging.

Both products—the carbonate and the hydroxite of lithium—are packed in fiber drums for shipment. Mine production and the rated plant capacity figures have not been released by the company to date.

Fourteen commercial compounds, as well as six forms of metal, are produced in Lithium Corporation's plant at St. Louis Park, Minnesota. Future plans call for additional compounds to be made at the Bessemer City operation.

In addition to its North Carolina holdings, Lithium Corporation also has mines at Hill City, Keystone, and Custer, South Dakota; and at Cat Lake, Manitoba and Amos Area, Quebec, Canada.

Personnel at the North Carolina operation include: J. N. McClure, mine manager; Jim Sullins, mine foreman; and D. D. Michalek, senior geologist. R. L. Nielsen is plant manager, Harold Andrews, production superintendent, and Wilson Setzer, process engineer.

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U.S.A. Metal & Mineral Prices

METALS

		January 20, 1956
COPPER:	**Electrolytic.** Delivered F.o.b. cars, Valley basis	43.00¢
	Lake. Delivered, destinations, U.S.A.	43.00¢
	Foreign Copper. Valley basis	43.00¢
LEAD:	**Common Grade.** New York	16.00¢
ZINC:	**Tri-State Concentrates,** jig, flotation 80% lead, per ton	$201.75
	Prime Western: F.o.b. E. St. Louis	13.50¢
	Prime Western; Delivered, New York	14.00¢
	Tri-State Concentrate, 60% zinc, per ton	$89.00
ALUMINUM:	**Primary 30 Pound Ingots (99% plus).** F.o.b. shipping points	24.40¢
ANTIMONY:	**Lone Star Brand.** F.o.b. Laredo, in bulk	33.50¢
BISMUTH:	(In ton lots) price per pound	$2.25
CADMIUM	**Sticks and bars.** 1 to 5 ton lots (Price per pound)	$1.70
COBALT:	**97-99%,** keg of 550 pounds (Price per pound)	$2.60
COLUMBIUM:	**Powder** Nom., per pound	$119.25
LITHIUM:	98% (per pound)	$11.00-$14.00
MAGNESIUM:	**Ingots (99.8%)** F.o.b. Valasco, Texas, per pound	32.50¢
MERCURY:	**Flasks.** Small lots, New York	$280.00
NICKEL:	**"F" Ingots (5 pounds). F.o.b. refinery,** Port Colbourne, Ontario	64.50¢
TIN:	**Grade A. Brands.** New York (Price per pound) Prompt delivery	$1.05
TITANIUM:	**99.3%** + Grade "A" (Price per pound)	$3.15-$3.45
GOLD:	**United States Treasury Price**	$35.00 per ounce
SILVER:	**Newly mined domestic.** United States Treasury price	90.50¢ per ounce
	Foreign Handy Harmon	90.50¢
PLATINUM:	**Per Ounce**	$97.00-$107.00
ZIRCONIUM:	**Sponge, Per Pound**	$10.00

ORES AND CONCENTRATES

BERYLLIUM ORE:	**10 to 12% BeO. F.o.b. mine,** Colorado	$47.00 per unit
	Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.	
CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight.	
	African (Rhodesian). 48% Cr_2O_3. 3 to 1 Ratio	$44.00-$45.00
	African (Transvaal). 48% Cr_2O_3. No Ratio	$31.00-$32.00
	Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio	$52.00
	U. S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.	
COLUMBIUM-TANTALUM ORE:	At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12)	
IRON ORE:	**Lake Superior.** Per gross ton Lower Lake Ports	
	Mesabi, Non Bessemer, 51.5% Fe.	$10.95
	Mesabi, Bessemer, 51.5% Fe.	$11.10
	Old Range Non Bessemer.	$11.10
	Old Range Bessemer.	$11.25
	Swedish, Atlantic Ports, 60 to 68% Fe. Contracts, Per Unit	22.00¢
MANGANESE ORE:	**Metallurgical grade.** 48 to 50% Mn. Long ton unit	$0.96
	Metallurgical grade. 46 to 48% Mn. Long ton unit	$0.94
	Metallurgical grade. 45 to 46% Mn. Long ton unit	$0.87
	Chemical grade. 80% MnO_2. Per Ton	$70.00
	Domestic U. S. Government ore purchasing depots: Butte, Montana; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Montana; base price of $6.43 per long ton unit of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40% Mn. Base price (48%) $2.30 per unit with premiums and penalties.	
MOLYBDENUM CONCENTRATE:	**90% MoS_2 F.o.b. Climax, Colorado. Per** pound of contained molybdenum, plus cost of containers	$1.10
TUNGSTEN CONCENTRATE:	**Domestic.** 60% WO_3 Per short ton unit	$63.00
	Foreign. 65% WO_3 Per short ton unit (Scheelite)	$35.00
	Foreign. South American, Spanish, Portuguese	$34.00
URANIUM ORE:	**Carnotite-Roscoelite.** F.o.b. purchase depot plus $0.06 per ton mile ($6.00 maximum), Grand Junction, Rifle, Durango, Naturita and Uravan, Colorado Salt Lake City, Marysvale, Thompsons, Moab, White Canyon. Green River, and Monticello, Utah. Shiprock, and Bluewater, New Mexico, Edgemont, S. Dakota, Riverton, Wyoming, Tuba City, and Cutter, Arizona. Base price for 0.10% ore is $1.50 per pound and up to $3.50 per pound of contained U_3O_8 plus $0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of $0.25 per pound for each in excess of 10 pounds. A $0.50 per pound development allowance paid on all ore purchases. At Shiprock all ores with more than 6% lime are penalized for excess lime. At Monticello ores will be paid for in accordance with metallurgical characteristics.	
VANADIUM ORE:	**Carnotite-Roscoelite.** V_2O_5 in ratio of more than 10 parts to 1 part of U_3O_8 are generally acceptable at all AEC depots, but excess not paid for at Marysvale, Monticello. Shiprock, and Bluewater Per Pound V_2O_5	$0.31

NON-METALLIC MINERALS

BENTONITE:	**Minus-200-mesh.** F.o.b. Wyoming points. Per ton in carload lots	$12.50
	Oil Well grade. Packed in 100 pound paper bags	$14.00
FLUORSPAR:	**Metallurgical grade.** 70% effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines	$32.00-$35.00
	Mexican. 70% f.o.b. border	$24.00-$24.50
	European, Atlantic Ports, 70%	$33.00-$34.00
	Acid Grade. 97% CaF_2 F.o.b. Kentucky, Illinois, Colorado	$47.50-$50.00
PERLITE:	**Crude: F.o.b. mine** per short ton	$3.00 to $5.00
	Plaster grades. Crushed and sized. F.o.b. plants	$7.00 to $9.00
SULPHUR:	Long ton, F.o.b. Hoskins Mound, Texas	$25.50
	Export	$30.50

LONDON METAL AND MINERAL PRICES

		January 20, 1956		Per Long Ton USA Equivalent cents per pound[1]
COPPER:	**Electrolytic spot**	£391	Os Od	48.87¢
LEAD:	**Refined 99%**	£117	Os Od	14.62¢
ZINC:	**Virgin, 98%**	£100	Os Od	12.50¢
ALUMINUM:	**Ingot, 99.5%**	£171	Os Od	21.375¢
ANTIMONY:	**Regulus, 99.6%**	£210	Os Od	26.25¢
TIN:	**Standard, 99.75%**	£815	Os Od	101.875¢
TUNGSTEN:	**Long ton unit, 276**	$38.64 per long ton unit		

1. With Sterling pound at $2.80.

Quotations on metals and certain ores through the courtesy of *American Metal Market*, New York, N. Y.

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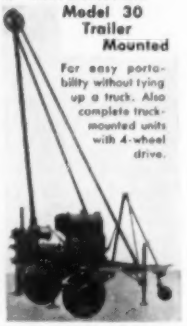

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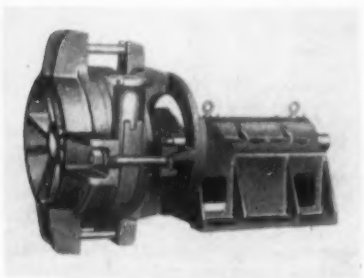
PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

Morris RX Slurry Pump Available in Seven Models

The Morris Type RX heavy-duty slurry pump is available in seven different models from 2 to 6 inch in size. The many features of the pump, according to the manufacturer, Morris Machine Works, include: renewable liners on both



sides of the impeller; accessibility of the wearing parts without disturbing the piping; and the fact that the stuffing box is subject to suction pressure only. Bulletin 185 gives further information about the RX pump. Circle No. 78.

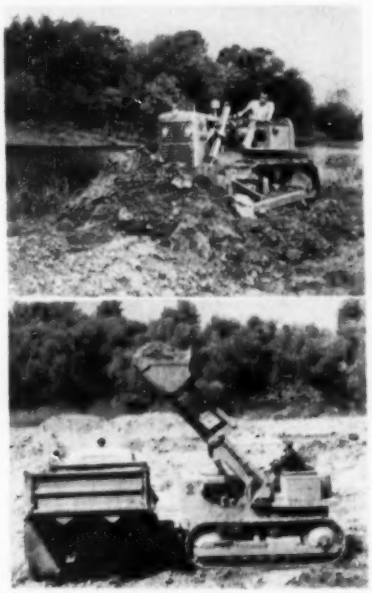
World's Largest Tractor-Scraper Combination

The first two 41-yard heaped capacity Wooldridge M-R-S Model OS-300B Scrapers powered by 500-hp, M-R-S Model "200 Special" tractors, which according to the manufacturers are the largest earth-movers ever built, were recently delivered to an on-the-job location.

Engineered to support 60-ton payloads at speeds up to 35 mph, the Wooldridge M-R-S Scrapers are equipped with

the new wide base tires, 33.5 by 33 front and 37.5 by 33 rear, providing extremely high flotation over spongy or loose surfaces. Flotation is further increased by distribution of payload over four axles instead of two or three.

Power for the big 43,000 lb. M-R-S prime mover is a Cummins V-12 Diesel engine, delivering a full 500-hp to altitudes of 5,000 ft. Circle No. 71 for additional information.



A-C Announces New Crawler and Tractor Shovel

Allis-Chalmers has announced two new Diesel-powered units, the 12,400-lb., HD-6 crawler tractor and the 19,600-lb., HD-6G tractor shovel with a rated capacity of 1⅛ cu. yd. Both were introduced in line with the company's engineering development and production policy to provide equipment of the highest performance and dependability, and with the lowest job cost possible.

Many features found in other crawler tractor models recently introduced by Allis-Chalmers are incorporated in the HD-6 and HD-6G. The heart of the HD-6 and HD-6G's newly engineered power train is the A-C HD-344 Diesel engine, a four-cylinder, four-cycle unit that develops 57 net flywheel hp, 45 hp at drawbar, and 55 hp at the belt. Circle No. 65 for further information.

Atlas Diesel Affiliates Adopt Standard Name

Representatives of the 27 companies throughout the world which comprise the Atlas Diesel organization officially adopted a common name to replace the widely varied company titles previously used. Each Atlas affiliate will now be known as Atlas Copco (followed by the country in which it is headquartered).

The parent company will be known as Atlas Copco Aktiebolag. The two United States affiliates, Copco Pacific, Ltd. and Copco Eastern, Ltd., will be known as Atlas Copco Pacific, Inc. and Atlas Copco Eastern, Inc.

Athey Announces New Rear Dump Trailer

Athey Products Corporation, Chicago, Ill., anounces the new Athey PR 15-Cat DW 15 Rear Dump Trailer. The PR 15 offers a capacity of 15.6 cu. yds., speeds up to 31.3 mph, right or left angle turns of 90°, and simply designed, 3-stage

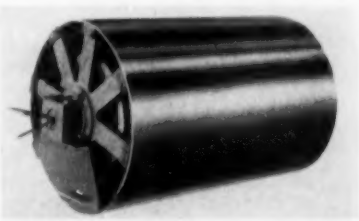
hydraulic hoists which tilt the body 60° for quick, positive ejection of any materials.

The entire loaded unit weighs 84,683 lbs. with 37% of the load on big drive wheels of the Cat 186-hp tractor. The body is all-welded into one sturdy unit built to handle rock or any other material, and is completely reinforced with box sections. The PR 15 features accurate hydraulic control. It can dump while still on the go. Non-stop turns can easily be made in 37 ft., with the PR 15's positive hydraulic steering. Circle No. 74 for further information.

New Motorized Head Pulley Saves Space and Money

Now available from J. D. Christian Engineers of San Francisco is a new, self-contained, motorized, head pulley. Called the PPT (Packaged Power Terminal), this unit results in a space saving of almost 50%, and an appreciable increase in efficiency.

Another practical feature of this unit is its lighter weight. As the transmission and motor are located within the pulley, the bulk and weight of parasite structures



normally supporting gear cases, chain drives, and motors are eliminated. Frictional losses are also minimized because chain drives, flexible couplings, belt drives, and pillow blocks are eliminated. Due to the enclosed helical gearing in anti-friction type, oil-lubricated bearings, an expected delivery of 96% or more of the motor power at the belt pull is warranted. Circle No. 77 for complete information.

Versatile Drill Features A Portable Power Unit

The Hitchcock Wonder Drill is a rugged, yet simple and practical piece of equipment; it is relatively light, and may be dismantled in a short period of time.

This drill is designed to drill both in a vertical position, and at an angle, with the motor in a horizontal position. The power unit is equipped with an automatic clutch, and consists of a 3.35-hp Briggs-Stratton gasoline engine, requiring but one grease fitting for lubrication. The engine may easily be removed to be used for other purposes. A 450-gph rubber-lined pump developing 50 psi, is powered by a 1.60-hp engine. The pump unit is also separate, and may be used for other purposes. Both core, or rotary drilling may be accomplished with the Hitchcock unit. Circle No. 79 for additional information.

Compressed Air Powers New Safety Floodlight

A new type of explosion-proof floodlight powered by compressed air turbo-generators and cooled by exhaust air has been introduced by Copco Eastern Ltd. According to the manufacturer, the new 150-watt, 12-volt, TGB 41 floodlight is especially adapted to mining, refinery, and other industrial work where electric power is not readily available.

The 22-pound, semi-portable lamp draws 23 cubic feet of air per minute at pressures ranging from 60 to 100-psi. Constant turbo-generator speed is maintained by special reducing valves regardless of variations in the primary air supply. A filtering device on the floodlight prevents foreign material from entering the generator through its ¾-inch air supply coupling. Circle No. 76 for further information on this useful light.

H. J. MAYER has been appointed executive vice president of Western Machinery Company, San Francisco, California. Other appointments announced recently by president JACK H. HOW were C. F. SKINNER, general manager of manufacturing, engineering and construction; R. B. UTT, chief executive engineer; and W. H. NEWTON, general sales manager for WEMCO products and Western Knapp Engineering services. Western Machinery Company was founded in 1915 by HARRY N. HOW, present chairman of the board. Pictured above are: top row, left to right, Mr. Jack H. How, Mr. Mayer, Mr. Newton; bottom row, Mr. Harry N. How, Mr. Utt, Mr. Skinner.

Notes From The Manufacturers

DON T. GRANGE, International Minerals & Chemical Corporation, is director of engineering for the firm. He has been chief construction engineer for the engineering division since January 1954 and was previously with E. B. Badger & Sons Company, Boston, Massachusetts. Mr. Grange's experience includes engineering and construction of refinery and chemical plants on projects throughout the United States and Europe. His headquarters in his new capacity will continue to be in Chicago, Illinois.

William P. McConnell has been appointed Pacific Northwest district manager of Smith Engineering Works, manufacturers of "Telsmith" crushers and other mining equipment. Mr. McConnell's experience at the Milwaukee, Wisconsin office of the company qualifies him to take over in Portland, Oregon with a territory including Oregon, Washington, Idaho, British Columbia, and Alberta.

Gordon Ley has taken over as district representative in the Colorado area for Electric Steel Foundry Company of Portland, Oregon. Mr. Ley has been with the company for fifteen years, the last six of these as an engineer specializing in ore processing equipment.

W. Davenport has advanced from general manager to vice president and general manager of the E. J. Longyear Company at Minneapolis, Minnesota. **V. N. Burnhart,** formerly assistant general manager, has been named operations manager and **Everett L. Peterson** has taken over as assistant production manager.

Daniel J. Girardi was recently named metallurgical engineer in charge of research and process control at the Timken Roller Bearing Company in Canton, Ohio. Mr. Girardi started as a research metallurgist at the company in 1946.

P. H. Malenchini has retired as export manager of the Euclid Division at Cleveland, Ohio of General Motors Corporation after 16 years with the company.

Cecil H. Green has been elected chairman of the board of Geophysical Service Inc. at Dallas, Texas. Mr. Green succeeds **J. Erik Jonsson** who is now devoting all his time to duties as president of the parent company, Texas Instruments Incorporated. **Fred J. Agnich,** formerly executive vice president, has taken over as president of Geophysical.

ROTARY FINE CRUSHERS: Sturtevant Rotary Fine Crushers crush or granulate to fine, even sizes without excess dust according to the manufacturer, Sturtevant Mill Co. "Open-door" accessibility permits fast, easy cleaning. They are available in output capacities from 1 to 30 tons-per-hour. A descriptive catalog is available to interested readers. Circle No. 1.

LOW COST ROTARY DRILL: The Rotadrill, made by Schramm, Inc. is a self-contained, self-propelled, and self-powered drilling rig. It is mounted on the Pneumatractor, a self-propelled compressor, and will drill a 4¼ inch hole to a depth of 500 feet. Special weight boxes and dual rear wheels on the 125 cfm, heavy Pneumatractor provide 10,000 pounds down pressure. Bulletin PR-55 gives all the details on the low cost Rotadrill. Circle No. 2.

BELT CONVEYOR BULLETIN: Stephens-Adamson Mfg. Co. announces the availability of a new Belt Conveyor Carrier bulletin covering the company's line of standard units. New addition to the S-A line is a long center roll carrier with either 35 to 45 degree slope and rolls for greater carrying capacity on light material. Other S-A products are also described. Circle No. 3 for your copy.

RUBBER CLOTHING: The B. F. Goodrich has recently published a catalog describing its latest line of protective clothing. Featured are rubber raincoats, hats, acid resistant gloves, and aprons. Send for your copy, Circle No. 5.

NEW MOTOR-GENERATOR: Large pedestal-bearing synchronous motor-generator sets for rolling mills, mine hoists, etc. are described in a new bulletin released by Allis-Chalmers Manufacturing Company. Various construction features of A-C generators and motors are described. Circle No. 6 for your copy.

ALL-PURPOSE SEISMOGRAPH: A new seismograph system designed for all types of seismic recording, whether high, conventional, or low frequency, reflection or refraction, has been announced by Houston Technical Laboratories. The model 7000B offers linear recording over the wide frequency range from 3 to 500 cps. Circle No. 7 for further information.

BATTERY-WATER UNITS: Hydrion battery-water units, according to A. E. Tomkin & Co. manufacturers, make it practical and inexpensive to change ordinary tap water to the chemical ionic purity of distilled water. By direct attachment to the water faucet, pure battery water may be instantly obtained by turning faucet on. Circle No. 8.

S LINE: Among the wide range of units now available in the recently announced International "S line" is the S-180 series. With gross vehicle weight rating of 18,500 pounds, this series is available in 130, 142, 154, or 172-inch wheelbase and is powered by the 137-hp International Black Diamond 282 engine. Circle No. 10 for further information.

SUBZERO SERVICE: The Tubular Products Division of The Babcock & Wilcox Company has recently issued a bulletin which provides information pertaining to tubular products intended for sub-zero temperature applications. Circle No. 11 for your copy.

TORQUE CONVERTORS on power shovels increase efficiency. The Twin Disc Clutch Company have found this to be true with its torque convertor installations on power shovels. Savings in cable, fuel, and maintenance cost have been realized. Circle No. 12 for further information.

CUSTOM DESIGNED CARS: The United States Steel Corp. has recently issued a 32-page booklet describing 20 different custom designed industrial cars. Among the cars described are a skip hoist, ore car, and others. Send for your free copy, Circle No. 13.

PROCESS PUMP BULLETIN: Ingersoll-Rand's new process pumps bulletin fully describes the vertically split, single-stage and two-stage type, process pumps. Included are design features of the pumps, dimension tables, cross sectional and installation views. Circle No. 14.

SUCTION PUMP: A heavy duty suction pump has been newly introduced to its line of slurry pumps by Morris Machine Works. This low speed, continuous duty pump is designed to handle abrasive slurries and other products. The removal of only four bolts opens the pump for most maintenance requirements. Circle No. 15 for free bulletin.

TUBE BULLETIN: A new folder on heat exchanger and condenser tubes has been issued by The Babcock & Wilcox Company. This bulletin covers pertinent information on various grades of carbon, alloy and stainless steel heat exchanger tubing. It also deals with the problems of installing these tubes by the expanding method. Circle No. 18 for further information.

FLUID DRIVE FOR DIESELS: A new illustrated catalog describing the new Type VS Class 2F Gyrol Fluid Drive for Diesel engine applications is now available from American Blower Corp. The catalog describes construction and operational features of this adjustable speed fluid drive unit. Circle No. 16 for your copy.

ORE ANALYZER: A new instrument for determining the amount of uranium and thorium in ores is now being manufactured by Tracerlab. It is called the Uranium-Thorium Analyzer. When used with an automatic sample changer, this system of ore determination is suited for large scale routine assays. Circle No. 17 for additional information.

NEW ELECTRODE: The McKay Co., Pittsburgh, Pa., recently announced the availability of the first of a series of iron powder, low hydrogen, hard surfacing electrodes. This electrode, called the McKay Hardalloy 48, with an as-deposited hardness of over 55 Rc, combines the speed of contact-type electrodes with the weld metal soundness of low-hydrogen weld deposits. Circle No. 30 for further information.

NEW ENGINEERING DESIGN has given greater durability, comfort, and ease of operation to the new International TD-18A Diesel Crawler tractor. The TD-18A now has 103 drawbar horsepower and 24,300 pounds drawbar pull. A boost to 124 engine horsepower at 1450 rpm is a feature which brings the TD-18A into the big tractor class. Circle No. 23 for additional details on this tractor.

pH METER: The Photovolt Corporation has recently released a new descriptive bulletin on its Battery-Operated pH Meter Model 125. This bulletin gives a complete description of the pH meter and accompanying accessories. Circle No. 32 for your copy.

NEW MOTOR GRADER: A comprehensive story of the engineering, design, and performance features that are incorporated in the new Allis-Chalmers heavy-duty Forty-Five Motor Grader is told in the illustrated eight-page, two-color catalog now available from the Allis-Chalmers Manufacturing Company, or by circling No. 34.

ARC WELDING: A new 200-page book, selling for $1, is now available from Hobart Trade School, Troy, Ohio. The book titled "Lessons in Arc Welding"

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ROCK STUDY: "Measuring the Crushing Resistance of Rocks and Ores" and "Measuring the Relative Abrasiveness of Rocks, Minerals and Ores" are the Titles of two articles by Dr. Benjamin B. Burbank that have been published in booklet form. Obtain your copy from Pennsylvania Crusher Division, West Chester, Pennsylvania, or Circle No. 36.

A NEW BOOKLET titled "Diamond Core and Drill Bit Selector" has been produced by the Koebel Diamond Tool Company. This booklet is designed to aid miners in the care and selection of diamond drill bits. For your copy circle No. 37.

GASOLINE ROCK DRILL: The Syntron Company of Homer City, Pa., have a new self-contained gasoline hammer rock drill. They state this machine will drill holes to a depth of 13 feet, at a rate of up to 2 feet per minute when used with hollow integral type drill steel with chisel bit. For further information circle No. 38.

UNUSUAL DESIGN: "Dura-Tred" Chains and Beaumont Drive Wheels for bucket elevators and conveyors are described in a new catalog released by the Beaumont Birch Company. The catalog includes a detailed discussion of the "chain with the wear Tread" design, and the manufacturer's traction sprocket. Types of available chain are also listed. Circle No. 43 for your copy.

NEW AC CRAWLER TRACTOR: Engineering, design, and performance features of the new HD-21 Diesel-powered crawler tractor are described in the new 16-page catalog now available from the Allis-Chalmers Manufacturing Co. Many photographs and illustrations are included as pictorial aids in telling the HD-21's story. Send for your copy, circle No. 42.

DIAPHRAGM VALVE: The Grinnell-Saunders Straightway Diaphragm Valve offers, according to the manufacturer, the extra advantages of straight-through flow for handling viscous materials, fibrous slurries, sludges, semi-fluids and solids in suspension. Further information about this new valve is available by circling No. 47.

INDUSTRIAL V-8 ENGINE: A new 8-page bulletin describing Le Roi's industrial 190 hp H540, and 285 hp H844 V-8 engines has been published by the Le Roi division of Westinghouse Air Brake Company. The bulletin uses charts, drawings, and diagrams to illustrate the advance design, performance, and economy of these two engines, which operate on gasoline, natural gas, or LP gas. Circle No. 44 for your bulletin.

NEW BIN INDICATOR: A new Roto-Bin-Dicator, a paddle-type bin level indicator for special installations, has been introduced by the Bin-Dicator Co. This all-new unit is particularly adaptable to installations in bins under pressure or vacuum; bins, chutes or conveyors handling materials containing large lumps which tend to "bridge" over a diaphragm; and bins handling materials which tend to "rat-hole" and prevent operation of a diaphragm. Circle No. 48 for bulletin and further information.

SUPER ELECTROMAGNET: A new line of rectangular electromagnetic separation magnets for removing tramp iron and other undesirable magnetic particles is announced by the Ohio Electric Mfg. Co. Designated as Ohio Super Magnetomotive Magnets, they are used in mines, quarries, foundries, smelters, etc., to remove tramp iron which might damage crushers and other expensive equipment. Arrangement of the center pole and two outer poles of Ohio SM Magnets provides a practically uniform high-Gauss field across the belt, which results in effective removal of tramp iron. For further information circle No. 49.

NEW UNIT removes sand from rotary drill mud: Dorr-Oliver, Inc. announces the availability of the Dorrco D-Sander, a completely new unit for removal of sand from rotary drill mud. Primary component of the D-Sander, developed specifically for this particular application, is a battery of 6-inch FR DoorClone centrifugal classifiers. The machine reduces both drilling time and wear on drill bits and mud pumps. Circle No. 50 for more information.

LABORATORY PRESS: A compact, economical, hydraulic laboratory press has been introduced by Wabash Metal Products Co., Wabash, Indiana. The press is designed to crush specimens of rock and ore for determining tensile strength or tons pressure required for crushing. Full 12 tons pressure is exerted by the manually operated hydraulic mechanism. Circle No. 52 for further information.

"THROW-AWAY" FILTERS: Highly effective filtration through its six "throw-away" filters, made of thick pads of glass insulation wool, is one of several features of the new after-filtering mechanism designed for the Torit model 219 FM-A cyclone-type dust collector by Torit Manufacturing Co., St. Paul, Minn., builders of individual dust collecting machines. Circle No. 54 for further information.

V-BELT DATA BOOK: A data book is available, titled "Engineering Standards, Multiple V-Belt Drives." The data in the manual is based on the latest engineering opinion and research and indicates the proper sheaves and belts to be used for the attainment of optimum efficiency and economy of the Drive with relation to the particular duty to be performed. Circle No. 55 for further information.

ADJUSTABLE SPEED DRIVE: New literature published by Electric Machinery Mfg. Company, Minneapolis, illustrates the new "Ampli-Speed" Magnetic Drive, which provides precise, adjustable speed power for a wide range of applications. Circle No. 57 for your copy.

WIRE ROPE STRAIGHTENER: The Cable Strate Company now has on the market a portable hand operated wire rope straightener. The machine removes bends, twists, loops, kinks from all sizes of cable, and sells for $35.00. Circle No. 58 for more information.

ALL ABOUT THE HD-6: The technical and operating story of the Allis-Chalmers 45 drawbar hp, HD-6 Diesel-powered crawler tractor is now available from the Construction Machinery Division of the company's Tractor Group, Milwaukee, Wis. Circle No. 68.

ENGINEERING CATALOG: A condensed engineering catalog (No. 51-A) is available from the Thomas Flexible Coupling Co. of Warren, Pa. The section on "How to Select a Flexible Coupling" will help you to determine the exact coupling you need for small pumps, mine ventilation fans, large crusher drives, or any other type of mine equipment. There are tables and drawings explaining the various types of couplings most commonly used in the mining industry. If you are working with power transmission equipment you will want a copy of this 32-page catalog. Circle No. 70.

CARBIDE BLANKS: A new catalog covering standard cemented carbide blanks for stone cutting tools was issued recently by Carboloy Department of General Electric Company, Detroit. Circle No. 80 for your copy.

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Michigan Chemical Corporation has entered the rare earths field through the acquisition of all of the assets of *Saturnium Corporation*. Organized several years ago for research and process development on rare earths, the company will continue this research and will place in operation pilot plant procedures now ready for commercial applications. The Saturnium research laboratory at California, Kentucky will be closed and its facilities moved to St. Louis, Michigan. Its president, Dr. Herbert J. Fleischmann, will become technical director of Michigan Chemicals' new *Rare Earths Division*.

The *Evangelical Lutheran Church of America* has filed two suits in Billings County, North Dakota county court in attempt at clarification of the word "mineral" as applied to uranium in oil and gas leases. The actions were directed against *Stanolind Oil and Gas Company* and the *Ohio Oil Company*. The suit is to determine whether oil firms with oil and gas leases can control discovered uranium ore. The church is trying to clear title to about 7,000 acres of land in Billings and Slope counties where uranium deposits have been found by the *Manidon Mining Company* of Mandan. Manidon holds the mining leases and the oil firms the oil and gas leases.

The Industrial Diamond Symposium will be held in Chicago March 19 through 21. Included in the technical session will be 12 papers, several by diamond industry authorities from South Africa, The Netherlands, Belgium, and England. The Symposium is co-sponsored by the Armour Research Foundation of Illinois Institute of Technology, and the American Society of Tool Engineers.

A research report by the Engineering Research Institute of the *University of Michigan* on the application of radioactive tracers to the study of metallurgical problems has been released by the Office of Technical Services. Results of their research demonstrate the value of high-resolution autoradiography. Among problems studied using autoradiography were diffusion of nickel into iron, distribution of sulfides in iron, distribution of bismuth in copper, diffusion of liquid bismuth into copper, diffusion of nickel into copper, distribution of hydrogen in copper-tin alloys, and distribution of sulfur in cast iron with spherulitic graphite.

Exploration drilling on the properties of *Virginia Mining Corporation* near Dillwyn, Virginia has been favorable, with latest results delineating more clearly the copper ore structure. About 34,000 feet of drilling had been carried out at this writing in exploration of the 8,173 acres comprising the Vimco holdings in the Dillwyn area. Aerial surveys and geochemical tests had indicated 51 anomalies. Further exploration is continuing. Encouraging results are also being obtained by operations on the Manchester tract where promising lead and zinc values have been uncovered.

A triple superphosphate plant with a capacity of 200,000 tons per year is being built by *American Cyanamid Company* at Brewster, Florida. Completion is expected by mid-1957. The plant site is on ground already owned by ACC at its phosphate mining headquarters in Brewster. This is intended to diversify the company's line of chemical fertilizers. *Chemical Construction Corporation*, an ACC unit, will design and construct the plant in collaboration with *Dorr-Oliver, Inc.*

The *U. S. Bureau of Mines* which pioneered the development of zirconium has stopped producing the strategic metal and turned the work over to private industry because private industry has now increased its capacity to produce the metal. The Bureau will place its own zirconium plant on a standby basis and concentrate on problems which have limited uses of the metal.

International Minerals and Chemical Corporation's Florida Phosphate Division has replaced the old 26-cubic-yard bucket with a 29-cubic-yard bucket on its 1250 B dragline, the largest dragline in the phosphate industry. The Super Scooper is in operation at the *Noralyn* mine.

Edward J. Chalmers, who has explored six of the 34 claims he holds on the Camp Smith National Guard Reservation near Peekskill, New York, is now seeking permission from the Board of Commissioners of the State Land Division at Albany to mine these claims. The board originally permitted him to explore six of the 34 claims but denied him access to the others. If granted the right to mine them, he reportedly plans to assign the claims to a new operating company, Peekskill Uranium Corporation.

U. S. Mica Purchasing Depot in Spruce Pine, North Carolina paid miners $2,862,426.72 during the 11½ months from January 1, 1955 to December 15. These payments were for strategic grades of mica for the national stockpile. Total for the year was expected to exceed $3,000,000.

Basic Atomics Inc. is core drilling for lithium on the S. S. *Weir Estate* property at Kings Mountain, North Carolina. The firm has a lease on a 20-acre tract; *Foote Mineral Corporation* leases the remaining 25 acres of the 45-acre estate. Basic Atomics is in the process of setting up a laboratory at Lincolnton where it leases property reported to contain an estimated 1,500,000 tons of lithium ore.

Branch Lawson, who recently purchased the *United Feldspar Corporation* plant site at Minpro, North Carolina (MINING WORLD, January 1956, page 94), is proceeding with plans to build a feldspar plant there. Machinery is on order and it is hoped that the plant will be in operation by the end of this year.

Republic Steel Company has reopened its *Fisher Hill* iron ore mine near Mineville, New York, and it will remain open at least until April. Idle since March 1954, it is considered a high-cost operation.

International Minerals & Chemical Corporation has established a Technical Department for the Bonnie phosphate chemicals plant near Bartow, Florida.

Great Lakes Ships Over 87,000,000 Tons in '55

Final figures for 1955 show that Great Lakes ore vessels hauled 87,459,853 tons of iron ore during last season, the second largest movement in the history of the Iron Ranges. The record was set in 1953 with 95,844,449 tons. Pictured above is one of the new ore carriers which helped to make the peace time record possible. As usual, Oliver Iron Mining Division of the U. S. Steel Corporation led the season with 36,200,000 gross tons shipped. Among some of the other totals released to date are: M. A. Hanna Company which shipped 13,988,287 tons; Inland Steel Company with 1,461,228 tons; Jones & Laughlin Steel Corporation 3,024,191 tons; Oglebay, Norton & Company 2,212,632 tons; North Range Mining Company 1,016,080 tons. Cleveland-Cliffs Iron Company has already announced a price increase of about eight percent for the 1956 season, which is expected to set the pattern for the industry. This amounts to about 85 cents a ton, and brings the price for Mesabi Range non-Bessemer to $10.95 per gross ton; Mesabi Range Bessemer $11.10; old range non-Bessemer $11.10; old range Bessemer $11.25; open hearth lump $12.10.

Responsibilities of the new department will consist of process and quality control, new developments, and liaison between the Engineering and Research Division of the corporation relative to process problems. The group will also give technical service to the Production and Engineering Departments as required. Raymond E. Tuttle has been made manager of the new department, which will consist of two present groups —process engineering group and the chemical control laboratory.

The *Defense Minerals Exploration Administration* has approved several applications for financial assistance on mica exploration projects. In Georgia, Edwin Herbert Schwab has received a contract for $5,524, government's share $4,143, to explore in Upson County. In North Carolina, *Erby Mining Company* has received a contract for $6,525, government's share $4,893.75, to explore in Mitchell County; *Branch Mining Company* $3,240, government's share $2,430, Avery County; P & C Huskins, $4,016, government's share $3,012, Mitchell County; *Shaffer Mining Company, Inc.*, $7,100, government's share $5,325, Ashe County; Howard Smith, $8,064, government's share $6,048, Avery County; Ed Boone, $10,940, government's share $8,205, Yancey County; and W. S. Flynt, $4,604, government's share $3,453, Mitchell County.

Haile Mines Inc. and subsidiary companies, for the fiscal year ended August 31, 1955, achieved record high production and revenues. Operating subsidiaries, *Tungsten Mining Corporation* and *Manganese, Inc.*, produced virtually at capacity throughout the year. Since the close of the last fiscal year, Haile Mines has acquired the entire outstanding minority interest of Manganese, Inc., which is now a wholly owned subsidiary. Consolidated net income after taxes and interest was $2,693,229 in 1955 compared with $1,259,099 in 1954.

Gypsy Mining Company has leased extensive feldspar deposits in Mitchell County, North Carolina from the *Whitehall Company*. Located on the head of Crabtree Creek, these deposits surround on three sides the famous *McKinney* feldspar mine now owned and operated by *International Minerals and Chemical Corporation*. Columbite has been found in the area in the past, and it is reported that Gypsy Mining is interested particularly in this mineral.

Arthur G. McKee & Company announces that it is constructing one of the nation's largest iron ore sintering plants for the Fairless Works of *United States Steel Corporation* in Morrisville, Pennsylvania. The contract reportedly calls for a $6,000,000 expenditure.

IRON RANGES

Reserve Mining Company has hired 450 permanent year-round workers for its Silver Bay taconite project in the past two months, and plans to take on more this month. Half of the 450 jobs were for maintenance repair men and trade and crafts workers; the rest were industrial or operating jobs. Reserve is training operating personnel on the job. The plant is scheduled for completion in the spring.

Oliver Iron Mining Division of *U. S. Steel Corporation* has let a contract to *Western-Knapp Engineering Company* for the design and construction of a fines recovery plant at the *Plummer* mine. The plant will use Humphreys Spirals to upgrade the present wash classifier overflow. Completion of the plant is expected in June of this year.

During the winter season, *Pickands Mather & Co.* is stripping at its *Tioga No. 2, West Hill, Bennett, Scranton,* and *Embarras* open pit mines on the Mesabi Range, and some stripping will be done at the *Mahnomen, Rabbit Lake,* and *Sagamore* pits on the Cuyuna Range.

Oliver Iron Mining Division of *U. S. Steel Corporation* plans to bring two new mines into production in the 1956 season. The *Sharon* near Buhl, Minnesota will be an integral part of Oliver's *Sherman* mine and will use that mine's crushing-screening plant and repair shops. Power lines and mine roads are now being constructed as a part of the mine development work. In the *Sauntry* mine, north of Virginia, power lines are being installed and mine roads constructed preparatory to the removal of overburden. Sauntry operations will be part of the adjoining *Rochleau* mine and will use the same shops and crushing and screening facilities. Work is also being started on an addition to the Rochleau crushing and screening plant which will increase the amount of coarse and fine ore production from this plant. It will be ready for the start of the 1957 ore shipping season.

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We do NOT recommend this job for the crushing plant maintenance welder, as proper rebuilding requires the use of special jigs and other expensive equipment. Why not call in our field man for a check-up on those used plates in your scrap pile?

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Phillips Buys Pumpkin Buttes Uranium Claims

The Phillips Petroleum Company has purchased 72 uranium claims in the Pumpkin Buttes area of northeast Wyoming from States Mines, Inc., of Lander, for $1,000,000 and with a seven percent gross royalty. Approximately $100,000 cash was paid down, with the remainder to be paid in one year in quarterly payments. Immediate exploration and development work was started by Phillips with production to follow shortly. The claims are located outside the previously withdrawn area recently opened for mineral entry. Considerable test drilling was performed by State Mines, with a sizeable ore body partially blocked out.

New Park Has High-Grade Ore in Pearl Vein Branch

Higher than normal mine grade gold, silver, and copper have been found in a branch of the Pearl vein on the 1,755-foot level of the New Park Mining Company at Keetley, Utah, according to W. H. H. Cranmer, president.

The high-grade ore is considered as an extension of ore found previously in the Pearl vein of the next highest level, the 1,625-foot level. This shoot is about 500 feet east of the main shaft. Crews are now starting to drift eastward in the Pearl vein from the main shaft on the 1,880 level, 125 feet below the high grade on the 1,625-foot level.

New Park has been considered as primarily a zinc-lead mine with production from both fissure veins and replacement deposits in limestone. However, gold and silver content of ores has increased in deeper sections of the mine.

Rock Mechanics Symposium Set at Colo. School Mines

The Department of Mining Engineering at the Colorado School of Mines is sponsoring the first Symposium on Rock Mechanics at the school in Golden, Colorado on April 23rd through 25th.

While mining engineering is most concerned with the problems of rock mechanics, the Symposium will be open to and hear discussions from civil engineers, geophysicists, and structural geologists.

The Symposium will spearhead a concentrated attack on the entire field of rock failures and their controls—from the theoretical, to the laboratory, to the mine. Papers will cover rock penetration and fragmentation (drilling, blasting etc.), design and support of underground openings, and caving methods of mining.

L. J. Parkinson, head of the School's mining department, is in charge of the program. C. W. Livingston, former head of the mining department and now a consulting engineer, will be the keynote speaker.

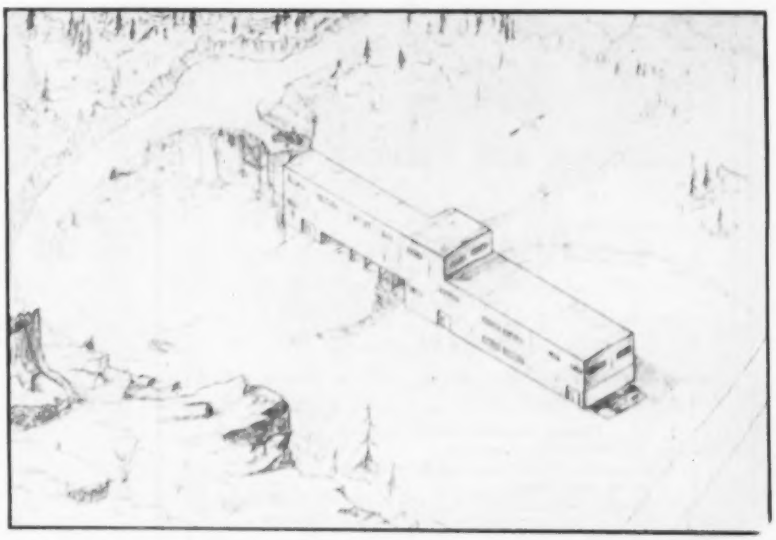
The remodelled Pandora mill of *Telluride Mines, Inc.* at Telluride, Colorado is going through a tune-up period. The mill's capacity has been increased from 800 tons per day to 1,400 tons per day with the labor force cut almost in half. Ore from the Meldrum Tunnel will be brought down through ore passes and drifts to the Mill Level Tunnel and then taken into the mill. Service to upper levels is through two 1,200-foot service raises, one at the north end of the mine and another at the south end. During the past year, ore passes, service raises, haulage drifts, and crosscuts were completed which totaled over 3,000 feet of raising and 6,500 feet of drifting. By the end of the second quarter of this year, it is anticipated that sufficient broken ore reserves will be on hand to relieve the pressure on the mine department to produce 30,000 tons of ore monthly.

Three companies are being considered by the *United States Atomic Energy Commission* for the contract to operate seven ore buying stations and certain other AEC facilities on the Colorado Plateau. The *American Smelting and Refining Company*, which had given up the contract effective December 31, 1955, agreed to extend it another month to January 31, to give the AEC additional time to select a successor. Currently being considered are *Ledoux & Company* of Teaneck, New Jersey, *Lucius Pitkin Inc.* of New York, and *United Sampling Service* of Grand Junction, Colorado. The latter is composed largely of ASARCO employees now working in the sampler operations. The contracts will be on a fixed-fee-cost-plus basis.

Tungsten ore, reportedly of good grade, was recently opened up at the *Dozer* mine at Nederland, Colorado. Following a previous announcement that the *Reynolds Uranium Corporation* had struck rich silver ore in the *Jo Reynolds* mine at Lawson, it became known that a crosscut at the Dozer mine had entered the ore indicated previously by an 8-foot diamond drill core section that assayed 2.25 percent WO_3. Drifting opened up 15 feet or more of ferberite ore estimated to contain 2 percent WO_3 or better. Grade of the ore will be determined from the assay of shipments of development muck soon to be shipped to the custom mill operated by *Cold Spring Tungsten, Inc.*

New Mar Uranium Company has obtained property in the Front Range area near Boulder, Colorado. Some drill holes have been sunk with favorable showings of ore. Operators report that the assays show presence of pitchblende, gummite, and other primary uranium ores. Assays run from about 0.30 to better than 1.0 percent U_3O_8. Company officials have taken samples from drill holes for a width of about 400 feet.

Climax Molybdenum Company's mining crews have set new records for total numbers of cars handled in a single eight-hour shift on both the Phillipson and Storke levels of the Climax mine at Climax, Colorado. The previous high on the Phillipson level had been 1,162 cars on November 10, 1955; the new record was 1,220 cars of ore on December 2, 1955. The standing record on the Storke



Emperius Builds New Mill at Creede, Colorado

The Emperius Mining Company is rebuilding its silver-lead-zinc flotation mill at Creede, Colorado at a cost of approximately $600,000. The company's original 125-ton-per-day mill and Diesel power plant were destroyed in August 1955 by fire. The new mill will have a 250-ton-per-day capacity. O. W. Walvoord, Inc. of Denver, Colorado designed the new mill and has the construction contract. Walvoord also built the mill which was destroyed by fire. The new mill follows the modern trend in mill design—flat roofed buildings on a nearly level site rather than on a steep hillside. One operator in the central section of the mill will be able to see the entire plant. Emperius has been Creede's largest producer since 1932 under the direction of Ben T. Paxson, former president, and Tyrus B. Paxson, new president and general manager. The company has consolidated such famous old mines as the New York, Last Chance, Amythest, Commodore, Volunteer, and Del Monte, and centralized mining operations through a long low-level tunnel. Creede has been famous for its silver, but in recent years, lead and zinc have grown in importance. Ore is found in fissure veins and shattered zones cutting rhyolite.

level had been 1,087 cars of muck on September 15, 1955; on December 11, a crew handled 1,280 cars in one shift.

Trace Elements Corporation of Grand Junction, Colorado, which last September signed a contract with the *U. S. Atomic Energy Commission* for construction of a pilot-scale mill (see MINING WORLD, September 1955, page 110), has now applied for permission to build a larger mill able to process "several times" the amount of ore originally agreed upon. The mill is to be located at Maybell, Colorado, and will be the first large uranium processing plant in the northwest Colorado-southwest Wyoming area. Presently, mines in the area are shipping to Rifle, Colorado. Trace Elements has been conducting pilot plant tests and these were responsible for the decision to build a larger mill, if possible. Should the AEC reject the proposal, the firm will proceed with plans for the smaller operation.

Construction work on *Uranium Reduction Company's* ore processing plant near Moab, Utah is well ahead of schedule according to *American Zinc, Lead, and Smelting Company*, which has a major interest in the operation. Construction of the $8,000,000 mill is under contract to *Foley Brothers*. The plant is expected to be completed and in operation by the middle of this year. American Zinc will manage the mill, under the leadership of Richard A. Young, vice president of the St. Louis, Missouri firm. Mitchell Melich is president of Uranium Reduction Company. (See MINING WORLD, August 1955, page 69 for details on the Moab mill.)

Centennial Development Corporation of Eureka, Utah has converted its development contract with *Monte Cristo Uranium Company* to an operating agreement. The firms will now share on a 50-50 basis any net profits after cost of mining the Cane Springs uranium property in Grand County.

Boyle Bros. Drilling Company, Salt Lake City, Utah, has taken over development of *Royal Uranium Company's* property at Indian Creek, San Juan County. Initial discovery of the deposit was made by Royal two years ago, and the *United States Atomic Energy Commission* has certified the property as a "major occurrence" of uranium. A channel of uraninite runs a distance of 3,000 with ore averaging eight feet in depth on the face. The channel varies from 70 to 100 feet in width. The company has been shipping 85 tons of 0.32 percent ore per day.

Operation of *Calera Mining Company's* cobalt refinery has been returned to the company after a year's experimentation by *Chemical Construction Company*. Chemical Construction, which built the refinery in 1952, took over management of the plant in February 1954 after operational difficulties developed. The refinery uses a new chemical process of Chemico. Cobalt is being recovered from cobalt-copper ore which is mined and milled at Calera's *Blackbird* mine in Idaho.

More than 600,000 tons of 0.5 percent U_3O_8 ore is indicated in exploration work on the *Almar* deposit which was recently purchased by Hidden Splendor Mining Company, subsidiary of Atlas Corporation. More than $9,000,000 was paid for 66⅔ percent interest and working control of the mine of *Almar Minerals, Inc.*, a Ruddock operation, which was then liquidated.

McFarland and Hullinger, Tooele, Utah, are driving a 2,000-foot exploratory tunnel through the porphyry at the *Ophir Hill* mine, 18 miles southeast of Tooele. The firm received a $52,350 grant from the *Defense Minerals Exploration Administration* for the lead-zinc project.

Five States Uranium Corporation, Albuquerque, New Mexico, is drifting on its Dirty Devil No. 3 claim. Some development ore has been shipped, and a stockpile is being built up on the property. The mine is located on Tomsich Mountain on the San Rafael Swell of Emery County, Utah.

Alunite Corporation's crushing mill at Marysvale, Utah has been placed in operation. Production is set at 25 tons of pulverized alunite per day for use as a fertilizer ingredient. The crushed product is blended at Midvale, Utah with nitrogenous compounds, and then packaged. *Salt Lake Hardware Company* is handling regional sales of the fertilizer.

Centennial Development Company, Eureka, Utah is sinking a 2,500-foot incline shaft in the *North Alice Group* of *Homestake Mining Company's* uranium claims, Big Indian District, San Juan County, Utah. The shaft is expected to be completed by next summer, and a sur-

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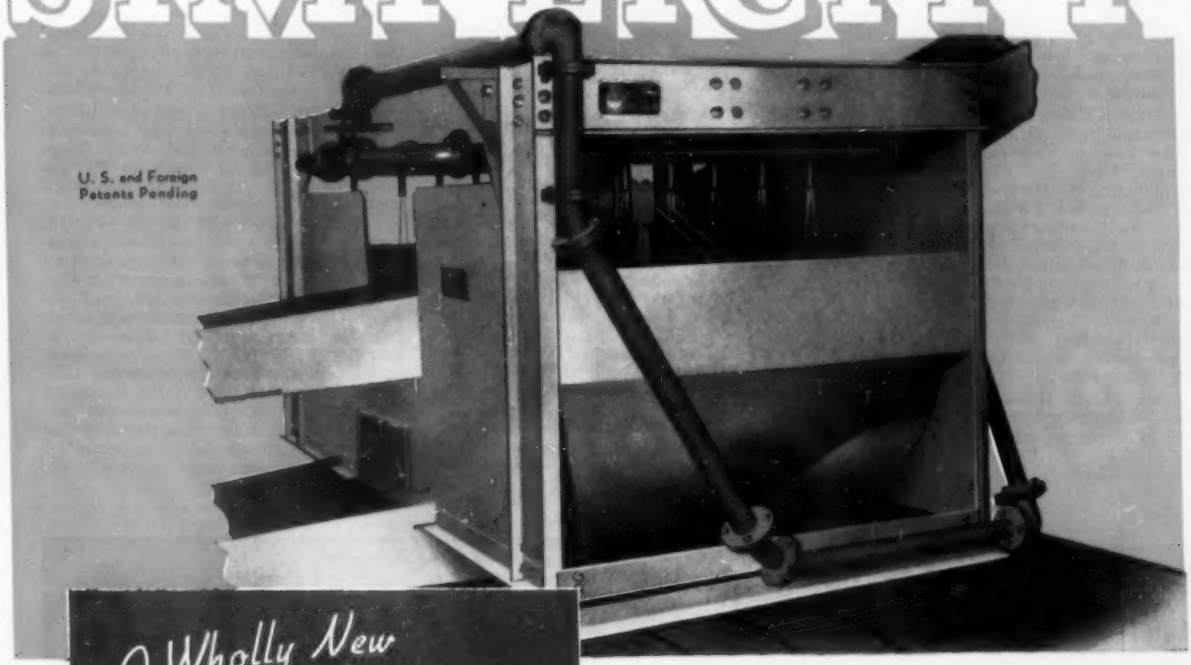

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face plant is already under construction. Homestake, after a year's diamond drilling, has reportedly blocked out nearly 200,000 tons of low-grade uranium ore. Depth of the ore body varies from 300 to 700 feet, and U_3O_8 content has been reported at from 0.15 to 0.25 percent. Centennial Development has completed a number of shafts in Utah, including two for Homestake at *La Sal* and *Little Beaver* properties.

Blue Skies Uranium Corporation has sold its assets and properties to the *National Uranium Corporation* of Utah. The sale includes all of Blue Skies' 67 claims, comprising 1,340 acres in Mesa County, Colorado, and San Juan County, Utah. In addition, cash, machinery, and other equipment are included in the transaction.

Christine Mines, Inc., Moab, Utah, will start exploratory drilling on two claims under lease in East Canyon, San Juan County, Utah. The claims are part of 12, including the *Humbug* claim on which the *Christine No. 1* mine is located. Drilling on the Humbug claim showed that 55 of the 82 holes drilled cut the mineralized horizon. *Moab Mines, Inc.* recently signed an operating contract with Christine Mines and has completed an incline shaft, and is now shipping ore. Christine also plans 9,000 feet of drilling on the six *Maybe* claims in the Kayenta formation, Big Indian Valley.

Silver Dollar Mining Company, Spokane, Washington, has leased the 10-claim *Cliff House* group of uranium claims in San Juan County, Utah. Early drilling is planned. Elmer E. Johnston is company president.

WYOMING

Reynolds Minerals Corporation, which is studying possibility of a multi-million-dollar steam power plant and alumina reduction installation near Buffalo, Wyoming, has leased a block of 1,913.41 acres of government coal land in the Lake DeSmet area. Reynolds and *Pacific Power & Light Company* are negotiating regarding a proposed $23,000,000 power installation at Lake DeSmet. If the power plant is erected, Reynolds is expected to locate the alumina reduction plant nearby.

Less than a month after the Pumpkin Buttes (Wyoming) withdrawn area was opened for mineral entry, the first uranium ore, amounting to two truck-loads, was delivered to the AEC buying station at Riverton. The shipment was made by the *Middle Buttes Company* of Recluse, Wyoming.

The *Wyoming Uranium Corporation* of Lander, Wyoming and Salt Lake City has announced the blocking out of a uranium ore body on its property in the Crooks Gap area of central Wyoming. In the same district, *Mile High Minerals, Inc.* of Denver has partially blocked out an ore body. Drilling is continuing, with ore being found on several levels, some as deep as 350 feet.

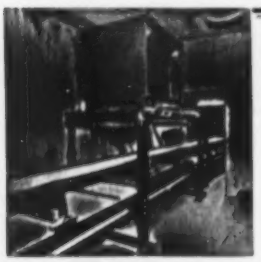
Royalty checks representing production of approximately $75,000 worth of uranium ore from the *John* and *Gunnell* mines in the Gas Hills area of central Wyoming were paid recently by *Vitro Minerals Corporation* of Salt Lake City. The payments were made to *Fremont Metal & Mining*, owner of the Gunnell claims, and to several individuals, who own the John claims, in a special presentation in Lander.

Lucky Mc, Inc. has started negotiations with the Atomic Energy Commission for construction of a uranium processing mill at its mine in the Gas Hills area of central Wyoming.

Vern Hughes, Riverton, owner of the *Hughes Mining Company*, has announced that stripping work is well underway at the *Pat'n Bill* mine on the *Blackstone No. 51* claim in the Gas Hills, Wyoming area.

Evaluation drilling is underway by the *Shawano Corporation* on what appears to be a large uranium ore body in the Baggs area in south-central Wyoming. The ore was discovered through its association with selenium.

In an extensive test drilling program underway by the two companies, a sizeable uranium ore body has been reported encountered by *Wyoming Uranium Corporation* and the *Gaddis Mining Company*. The body, only partially delineated, lies around the southeast corner of Section 16, T. 28 N., R. 92 W. A State lease to Section 16 is held by Wyoming Uranium, while the mining claims bordering the southeast corner of the section are held by Gaddis. It has been reported that high-grade uraninite has been identified as one of the components of the 40-foot-thick deposit.



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Polaris Mining Company is exploring a mineralized area found by diamond drilling on the new 2,500-foot level of its *Silver Summit* mine in the Coeur d'Alene district's Silver Belt southwest of Osburn, Shoshone County, Idaho. The find is 450 feet from the *New Purim* boundary. Commercial silver-copper ore first was found in the Silver Summit at a depth of 3,000 feet and opened down to the 3,400-foot level.

In the Chester area of the Silver Belt (Idaho), *Polaris Mining Company* is opening a mineralized zone found by diamond drilling several years ago from an exploration lateral driven from *Silver Summit's* 3,000 level. Preparations also are being made to test the vein at 200 feet greater depth by diamond drilling.

Rainbow Mining and Milling Company ground in the Silver Belt of the Coeur d'Alenes, Idaho soon will be penetrated by a long easterly bore *Polaris Mining Company* is advancing from its 3,000 level workings in the *Silver Summit* mine. The tunnel had been advanced approximately 8,000 feet at last report. Rainbow is controlled by *Coeur d'Alene Mines Corporation.*

A 40-foot wide zone of tungsten mineralization has been crosscut by *Salmon River Scheelite Corporation* at its 12-claim property northwest of Clayton, Idaho. At last report, the zone had been opened for a distance of 30 feet and about 400 tons of ore stockpiled. The showing is in an adit which gets 200 feet depth on the outcrop. Work is under a $39,040 DMEA contract. Harvey Penney of Salt Lake City is president.

Recent bulldozing at the property of *R-G Mining Company* in the Beaver Creek area north of Wallace, Shoshone County, Idaho, uncovered two new veins carrying values in lead and silver. The ground first was prospected some 30 years ago and several hundred feet of tunneling disclosed two short oreshoots. Ray P. Klepinger is president of the recently incorporated company.

A 400-horsepower, double-drum hoist was being installed at *Lucky Friday Silver-Lead Mines'* new 2,300-foot, three-compartment shaft east of Mullan, Shoshone County, Idaho, at last report. The hoist was purchased from *American Smelting and Refining Company* and reconditioned. It formerly was used in the worked-out *Morning* mine at Mullan. Production has been averaging about 100 tons daily. Dave Elder is mine superintendent.

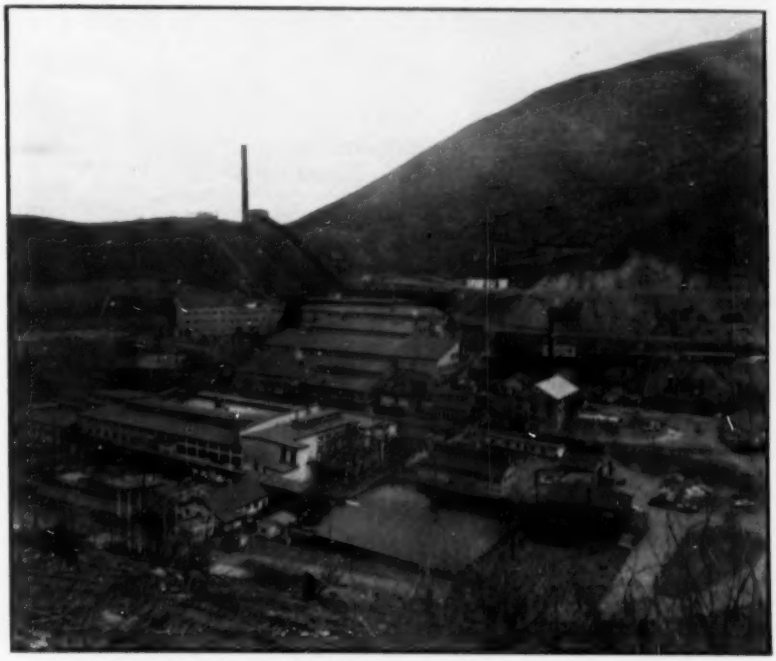
Highland-Surprise Consolidated Mining Company is opening a second vein structure intersected in an exploration adit at its new property near Stanley, Custer County, Idaho. The vein contains mostly lead in contrast to a zinc vein previously exposed over a 45-foot width. Work is under a $59,750 DMEA contract. *Sunshine Mining Company* is financing Highland's share of the costs under a profit-sharing agreement. Tibor Klobusicky is superintendent.

Potash Company of America is conducting exploratory phosphate operations on the *McIlwee* property in Paris Canyon near Montpelier, Idaho. Present plans call for driving a tunnel north toward Sleigh Canyon and driving raises. They also plan to extract the ore with conventional coal mining equipment instead of the usual hard rock equipment. The firm does not plan to process the ore in the immediate future but has signed an agreement with *San Francisco Chemical Company* for it to purchase the raw rock when in production.

The *Mill* and *Empire* claim groups in the Marysville area, Lewis and Clark County, Montana, have been taken over by *Montana Mining and Milling Co., Inc.*, a Delaware Corporation with offices in Helena. Plans include establishment of a townsite, erection of buildings, and enlargment of the mill to 150-tons per day (three shifts). A. A. Mott, New York, is president; Don Hoiekvam, Helena, vice president in charge of operations; A. Ditchik, director; Judge E. K. Cheadle of Billings, vice president and general counsel. The firm's main offices are in New York City.

Autunite type uranium has been discovered two miles east of Saltese, Mineral County, Montana. Bulldozer trenching done up to the time winter forced suspension of work indicated a width of 35 to 70 feet and a length of some 300 feet. The property has been acquired by *Western Resources, Inc.* of Spokane, Washington. *Yreka Mining Company*, with a lead-silver prospect near Kellogg, Idaho, has acquired 200,000 shares of Western Resources stock and an option on an additional 800,000 shares. Resumption of work is planned as soon as weather permits. Wellman Clark, Spokane mining attorney, is president of both firms.

Underground work at the property of *Basin Jib Gold Mines Inc.* at Basin, Montana seems to be confirming values obtained from surface drilling. Samples taken across the last 3.5 feet of a crosscut on the 300-foot level showed 0.08 ounce gold, 3.2 ounces silver, 0.46 percent lead, 0.76 percent zinc, and 2.39 percent copper per ton, although the cut had not yet reached the footwall. Shaft sinking was started last fall, and stopped when a depth of 345 feet was reached. A station was cut on the 300 level and the crosscut was driven 120 feet to the vein zone. When the footwall is reached, a drift will be started in both directions. It is hoped that underground development will outline sufficient ore



Bunker Hill & Sullivan To Expand Zinc Plant

Bunker Hill & Sullivan Mining and Concentrating Company will expand its electrolytic zinc plant west of Kellogg, Idaho as soon as weather permits. Ultimate goal is a 50 percent increase which would raise production from a current 4,800 tons monthly to 7,200 tons of slab zinc monthly. However, the first objective will be to increase capacity to 6,000 tons within the next year and a half. Cost of this phase of the project will be about $7,000,000. Bunker Hill & Sullivan acquired full ownership of this plant last fall in an exchange of stock with Hecla Mining Company. At that time, Bunker Hill and Hecla each owned 50 percent of the Sullivan Mining Company which, in turn, owned the zinc plant. Bunker Hill acquired Hecla's 50 percent in exchange for 275,000 shares of Bunker Hill worth nearly $50,000,000 in today's market. The zinc plant, which began operations in 1928, produces a super high-grade 99.99 percent zinc which is sold under the trade name of "Bunker Hill Brand." The present plant facilities are shown above.

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Recently incorporated in Montana were: *Valley View Mining Exploration Company* at Townsend, by Henry J. and Warren Schreiner of Townsend, and Allen A. Saalasti of Tioga; and *Normont Mines, Inc.* of Butte, to mine in Madison and other counties, by Harry W. Rundell of Cardwell, Charles A. Tout of Victor, J. J. McGreevy of Medicine, Washington, Richard W. Rundell of Cardwell, and D. D. Tuttle of Flint, Michigan.

OREGON

H. K. Riddle of Payette, Idaho has applied for a DMEA loan to continue development work on a quicksilver prospect near Vale, Oregon owned by the Jordon brothers. John Stringer of Nyssa, Oregon holds the lease on the property and Mr. Riddle is financing development work under a sub-lease agreement.

Exploratory development work is underway on a new uranium prospect named the *Alex-Ladd* claims, on the east flank of Steens Mountain about one mile from the recent Pike Creek discovery made by Dewey M. Quier. The Alex-Ladd claims are held jointly by Harry and Don Alexander of Andrews, Oregon, Fred and Nellie Ladd of Seattle, and the *Miller Mining Company* of Joseph, Oregon. An access road has been completed. Peter Relos and associates of Portland are developing the Dewey Quier discovery. A tunnel is to be driven along the contact between the rhyolite brecca and tuffaceous clays to explore the zone at depth.

Comstock Uranium and Tungsten Company of Elko, Nevada reports that chromite ore has been located at the end of a 300-foot development tunnel in the *Haggard and New* mine near John Day, Oregon. The ore body is said to have inferred reserve of 15,000 to 20,000 tons and plans are to ship to the government ore buying station at Grants Pass. Lower grade ores would be treated in a renovated 100-ton-per-day mill on the property which was purchased from Burt Hayes and associates.

Fall Creek Mining Company, Inc., of New York is exploring the *United Copper Gold Mines Company* property on Fall Creek, Josephine County, Oregon, under lease. Reopening of old workings and diamond drilling is planned. An access road has been built and a mine camp constructed. If findings warrant, a mill will be built. Earl White of Grants Pass is general manager.

WASHINGTON

Bear Creek Mining Company, subsidiary of *Kennecott Copper Corporation*, has made its scheduled $30,000 payment on the *Glacier Peak Mining and Smelting Company* property about 45 miles from Darrington, Washington. The company made an initial down payment of $15,000 last fall on the $450,000 option to pur-

chase the property. Further payments are to continue until 1959, with Bear Creek retaining the option to drop the property at any time. Exploration was halted in December 1955 by weather conditions, but will be renewed in the spring.

Daybreak Uranium, Inc. has uncovered a near-surface zone of what it believes to be uranium ore on its *Bair* lease in the Spokane Indian Reservation, Stevens County, Washington. The Bair lease adjoins the *Lowley* lease, where the company has uncovered uraninite near the surface. The brownish uranium mineral has not been identified. The firm is concentrating on developing its reservation deposits during the winter. It has suspended autunite shipments from its Mount Spokane district mine, Spokane County, because of road conditions. Kae H. Sowers, Opportunity, is secretary-treasurer.

Dahl Uranium Mine, Inc. has completed surface bulldozing and other exploration work under a small DMEA contract and at last report was preparing to diamond drill the most promising showings. Company holdings are in the Mount Spokane area. Harwood J. Tibbits of Spokane is president.

Old Frontier Uranium, Inc. of Green River, Utah, and Eatonville, Washington, has leased acreage across the Spokane River from two near-surface discoveries of uraninite near the southern boundary of the Spokane Indian Reservation. Bulldozing has been started and a diamond drilling program is planned. Old Frontier also owns 231 mining claims in Emery, Wayne, and San Juan counties, Utah, of which some have been leased.

Ore-grade autunite mineralization has been found in some of 52 wagon drill holes put down by *Kit Carson Uranium, Inc.*, Spokane, west of Mount Kit Carson in the Mount Spokane district of Washington. The holes were drilled to depths of 50 to 156 feet. Depth of the mineralization varied from a few feet to about 150 feet. C. M. (Corky) Smith has the drilling contract. R. Max Etter, Spokane, is president, and Ellsworth I. Connelly, Spokane, secretary-treasurer. *Lexington Silver-Lead Mines, Alpine Mining Company* and *Hunter Silver-Lead Mines* are developing the property for shares.

Utahcan, Inc. of Spokane is planning a deep test in the Mount Spokane uranium district, northern Spokane County, Washington. The firm plans to use an $80,000 rotary rig owned by W. H. Myers and associates of Calgary, Alberta, Canada. It is hoped to find primary uranium ores beneath the autunite now being mined at the surface in the area. E. M. Rasmussen is managing director and vice president.

National Uranium Corporation of Idaho has contracted with James Doyle of Wallace, Idaho, to drive an exploration tunnel at the firm's leased ground in northern Spokane County, Washington. The tunnel will get about 100 feet of depth on a radioactive vein exposed by surface bulldozing. Six radioactive veins have been exposed in bulldozing under direction of John B. Platts, Wallace mining engineer.

Glenn and Merritt Galbraith of Wellpinit, Washington have been granted a 40-acre lease for manganese and associated minerals six miles northwest of the *Midnite* uranium mine in the Spokane Indian Reservation, southwestern Stevens County. Bulldozing has uncovered flat-lying bands of manganese ore up to eight inches wide, interspersed with layers of decomposed granite, feldspar, argillite, and conglomerate. Radioactivity is three to four times above background.

Germania Consolidated Mines, Inc. has been diamond drilling a radioactive area just north of the Spokane Indian Reservation in southwestern Stevens County, Washington. The site is deeded land north of the firm's tungsten mine inside the Reservation. Drilling of tribal leased land also is planned. Henry Franz, vice president and managing director, has been supervising work.

Affiliated Mines, Inc. of Spokane has been incorporated by Vernon R. Gilmore, Robert B. Johnson, and others, of Spokane with $50,000 capitalization to develop uranium showings in northern Spokane County, Washington. The firm has leased five properties covering 620 acres on the west slope of Mount Kit Carson. Results of bulldozing and diamond drilling done to date have been encouraging.

Northern Pacific Uranium Company has been incorporated at Pasco, Washington, with $300,000 capitalization to explore 600 acres of leased land north of Spokane. Promising autunite samples have been reported. Robert Kennison is one of the incorporators.

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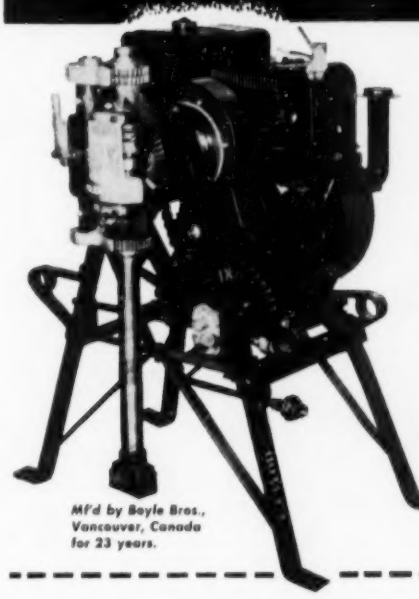

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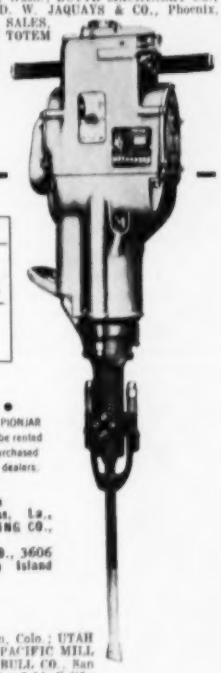

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Anaconda Company Acquires Leases and Options On Three Arizona Copper Mining Properties

Leases and purchase options on three mining properties in the Pioneer (Superior) mining district of Arizona have been acquired by Anaconda Company of Montana, according to an announcement by Clyde E. Weed, vice president in charge of operations. The properties covered by the agreements are those of Belmont Copper Mining Company, Queen Creek Copper Company, and Magma Superior Copper Company.

While exact figures on the purchase prices set in the agreements were not given, it is generally understood that the contract calls for $800,000 for Belmont holdings, $400,000 for Queen Creek, and $200,000 for Magma Superior. The total area in the combined Queen Creek and Belmont properties is 3.45 square miles immediately adjoining Magma Copper Company at Superior.

According to a statement by H. T. Cuthbert, secretary-treasurer of Belmont and Queen Creek companies, "Anaconda has promised to promptly start exploration and development work for the purpose of finding and opening up ore bodies and producing therefrom, and that said work will be continued diligently and perseveringly during the lifetime of the agreement between themselves and Queen Creek and Belmont until the purchase price has been paid in full or the argreement terminated."

Mr. Cuthbert also commented that he feels confident that Anaconda will find and open up, within the next 10 years (the period covered by the agreement), one or more high-grade mines in the Pioneer mining district.

Frank C. Brophy of Phoenix is president of Belmont Copper; James J. Cox, Jr., Phoenix, president of Queen Creek; and Philo H. Halleck, president of Magma Superior. Neil C. Clark is chief counsel and Cuthbert is secretary-treasurer of both Belmont and Queen Creek; Mrs. Laura C. Davidson, secretary-treasurer of Magma Superior.

Claims of the Queen Creek property were located in the early 1900's and major prospecting started in 1916 when the Queen Creek Copper Company was organized by Alexander Mackay and F. S. Stephen. The main shaft was sunk to water level at an inclined depth of 800 feet, and approximately 800 feet of drifts were driven on various levels.

The Belmont mine was prospected in 1913 by Calumet and Arizona Mining Company, but the work was terminated by the war after the shaft had been sunk to the 700 level and about 6,000 feet of work was done on the 140, 500, and 700 levels. In 1925 the Mackay interests organized Belmont Copper Mining Company to acquire the property. Subsequently, the three-compartment shaft was sunk to the 1,650-foot level. Development by this company totaled 16,000 feet of drifts and crosscuts, 1,000 feet of raises and winzes, 925 feet of shaft, and about 50,000 feet of diamond drilling. Depression conditions in the mining industry, together with the death of Mr. Mackay, forced the termination of Belmont's development plans. Since then, activity at the property has been intermittent and principally by lessees.

The entrance of Anaconda into the Superior district, home of Magma Copper Company, has created more-than-ordinary interest. Mining men comment that it is the first time in many years that a major copper producing company had broken what has seemed to be an unwritten law and undertaken an exploration project in a camp or district dominated by another major producer.

Mohave Mining and Milling Company of Wickenburg, Arizona, has completed the installation of its flotation and sintering plants and test runs are in progress. The sintering plant is located about six miles northwest of Wickenburg, alongside the Santa Fe Railroad, and the flotation plant is in Box Canyon. When full capacity operations are attained, the company expects to employ three eight-man crews on a three-shift basis at the flotation plant, while the sintering plant will require four men on the day shift and two at night. Manganese ores from the company's various properties are first treated at heavy media plants in Box Canyon and at Artillery Peak. The fines then go to the flotation plant where they are ground to pass a 60-mesh screen. The resulting concentrates are sintered to form a marketable product which is stockpiled for grading and shipment. Mohave Mining is planning to ship its manganese production under the government's carlot program. H. F. Lynn is president of the company and in direct charge of operations at Wickenburg.

Jontex, Inc. has started exploration work on a group of uranium claims located on Hog Mountain between Cherry Creek and Sombrero Peak, near Globe, Arizona. At present seven men are working at the property engaged in diamond drilling and surface work. As soon as the AEC access road is completed, the company expects to step up development work and start ore shipments to the AEC buying station at Cutter, Arizona. The claims are owned by R. J. Metzger and R. W. Quine, but leased to Jontex.

The *Spartan Mining Company* of Kingman, Arizona has made a carload shipment of uranium ore from its property on the east slope of the Hualapai Mountains in Mohave County, Arizona, to *Vitro Chemical Company* at Salt Lake City, Utah. According to Dick Hart, superintendent, the ore shipped will average 0.8 percent uranium. Spartan Mining Company, headed by Charles E. Howell, Ralph Antles, and associates, is operating the old *Democrat* mine under a bond and lease arrangement with the owner, Sylvia Vukoye. Work was started several months ago and has included the cleaning out and timbering an old drift for a distance of about 100 feet and sinking a 20-foot winze. Plans are said to call for sinking the winze to a depth of 100 feet, then additional drifting and raising to provide a vertical shaft for future operations. Five men are employed at present. The Democrat originally was worked as a gold-silver property in the 1870's and 1880's.

George Kaske of Sahuarita, Arizona has received a DMEA contract for exploration work at his *Austin* tungsten property, eight miles east of Dos Cabezas, Arizona. The DMEA contract is for a total of $10,000 with the government participating to the extent of $7,500. A 40-foot vertical shaft at the mine is said to have exposed a 30-inch vein which averaged about 2.0 percent scheelite. The vein also carries a considerable quantity of both lead sulphides and lead carbonates. The exploration work Mr. Kaske proposed to finance with the DMEA loan includes the driving of a 160-foot tunnel to intersect the vein, 50 feet of raising, and 50 feet of crosscutting.

Standard Tungsten Corporation is preparing to buy outside tungsten ore to supplement its own ore supply in a planned expansion of tungsten production from its mill at Benson, Arizona. It had been drawing its ore from mines in Pima and Cochise counties, Arizona and Hidalgo County, New Mexico, now owned or leased by the company. It is interested in buying tungsten ore of any millable grade which is higher than 0.5 percent in excess of 50 tons lots. The purchase will be made f.o.b. mill, but the company is willing to haul in any ore so purchased with its own trucking facilities if necessary.

Open-pit mining has started at the *Pacific Coast Borax Company's* huge $18,000,000 expansion project at Boron, Calif. which includes converting underground to open-pit mining. Construction of new concentrating and refining plants is well underway and completion is expected next year.

Calaveras Copper Company has leased its mines and copper leaching plant at Copperopolis, 23 miles east of Stockton, California, to Daybreak Uranium, Inc. of Opportunity, Washington. The Washington firm, which is shipping uranium ore from the Spokane area, has installed a special Worthington pump and expects to recover a 43 percent copper concentrate from mine waters. The 30 miles of tunnels in five old mines have not been pumped out since 1930. Union Copper Company, a Washington corporation, has been organized as the operating subsidiary. Daybreak owns 60 percent of the subsidiary and Fred Arisman of Copperopolis, the remainder. James F. Fox is president of Daybreak.

Kaiser Steel Corporation set a new annual record for iron ore production at its *Eagle Mountain* mine in California. Total production was 2,020,000 tons, as compared with 1,377,384 tons in 1954 and 1,759,437 tons in 1953.

The *Natomas Company* continued to operate five dredges in the Folsom district of California throughout last year, although one dredge was idle for a six-week period while undergoing repairs. Gross production in the district was nine percent less than during the previous year, but this was partially offset by a seven percent reduction in operating costs. At the company's *Greenan Placer* site in Nevada, the dredge was severely

damaged early in the year and the remaining reserves did not appear to warrant repair so the dredge was dismantled and stored. Combined output in California and Nevada during 1955 was 22,431,152 cubic yards dredged as compared with 25,067,374 cubic yards in 1954.

Balboa Mining and Development Company, together with a group in San Francisco, has acquired exploration rights on a portion of the El Tejon Ranch near Bakersfield, California. Operation of the *Tejon* claims will be under the direct supervision of George C. Heikes, who is president of Balboa.

King Solomon Mining Company, Inc. and *Apache Uranium Corporation* have purchased the *Arcturus* and *Rusty Pike* claims in Inyo County, California from Lucian Gaskins for $750,000. A new 50-ton-per-day flotation mill is being installed. Located about 50 miles northwest of Baker, California, the Arcturus claims are principally in silver and lead, while the Rusty Pike properties contain gold and copper-bearing ore. Uranium and thorium are reported to be present on both properties to some extent.

New Jersey Zinc Company is test drilling two famous old Mother Lode gold mines near Copperoplis, Calaveras County, California. New Jersey Zinc has leased the *Royal* and *Mountain King* mines which cover about 500 acres. *Joy Manufacturing Company* has the contract for the initial diamond drilling work. Stephen Mitchell is resident manager for the project.

NEVADA

Apex Uranium, Inc. and *Uranium Mines, Inc.* have agreed to merge their interests which lie in the Austin area of Nevada. Drilling operations by Apex have been said to be promising. One hole on the *Diamond* claim is now down about 100 feet and will be sunk to at least 1,000 feet. The hole is northeast of the old King Alfred shaft.

The *National Mercury Corporation* has taken over the old *Pershing* mine near Lovelock, Nevada, and has also acquired 540 acres of patented land and 40 adjoining public land claims. Exploration of the area is being carried out under the direction of William Enman, and some ore has been located. It will be mined by open pit, and a 70-ton mill will be erected.

In the Lovelock, Nevada area, several small mercury operations are in progress. C. C. Chopin has leased the *Red Bird* mine and is rehabilitating it, while Hugo Dollman is operating a tube retort on his property. Noble and Taylor are bulldozing some cinnabar veins; Warren Meissner and Bill Cline have a group of unpatented claims that were defaulted by the *Pershing Quicksilver* interests and some small-scale production is underway.

The *Deius Ego Corporation* is developing an open-pit uranium mine in the Copper Kettle district of the Stillwater Range in Nevada. The firm has 94 claims which it acquired from a group headed by Cecil Bridges of Lovelock. Walter F. Gertz is president of Deius.

All-States Mining and Development Corporation has been incorporated in Humboldt County, Nevada. The incorporators and directors are Carl H. Moore and H. L. Wahl of Sutherlin, Oregon, and Peter H. Gourley of Oakley, Oregon.

National Minerals & Mining Company has decided to undertake core drilling on its holdings which are located in the old Rhyolite district of Nye County, Nevada. The firm holds 45 claims in the Bullfrog area of Rhyolite.

The *Rochester Plymouth Company* is pumping out its mine in the Rochester Canyon area of Nevada, and plans to sink a shaft 100 feet. In the 1930's the mine was a silver and lead producer under the name of *Buck & Charlie* mine. The present company installed a flotation mill about 15 years ago and has kept it in running order since then.

The *Constant Minerals Separation Process, Inc.* of Reno, Nevada is currently testing about 100 claims it owns north of Virginia City for high-grade mineralization.

NEW MEXICO

The *United States Smelting, Refining and Mining Company* reportedly has leased its *Bullfrog* lead-zinc mine near

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The *Oscura Company Inc.* of Dallas, Texas plans to build a 200-ton lead mill at the former *Portales Mining Company* mine in the Oscura Mountains. A mill there burned down a year ago. H. M. Prince of Socorro, New Mexico will manage the new mill.

The *Kelly Workings* and the *Lynchburg* mine, both lead-zinc operations near Magdalena, New Mexico, are to be reopened, according to the state mine inspector. Both are on lease from the *Empire Zinc Division* of *New Jersey Zinc Company*.

The *Atchison, Topeka & Santa Fe Railway Company* has announced plans to reopen its Hanover station (New Mexico) which was closed in July 1954 when lead-zinc mining activity declined in the area.

Permian Basin Uranium Company, with properties north of Grants, New Mexico, has awarded a contract to *Boyles Brothers Drilling Company* of Salt Lake City, Utah to develop its claims under a 50 percent interest agreement.

Haystack Mountain Development Company, a subsidiary of the *Atchison, Topeka & Santa Fe Railway Company*, is currently negotiating with a contractor for underground mining of the famous *Haystack* uranium mine near Prewitt, New Mexico which was one of the first large open pit uranium operations.

Iola Uranium Corporation has contracted with the *G and S Mining Company* and Raymond Senn of Socorro, New Mexico to drive an adit to a 5½-foot vein located by core drilling.

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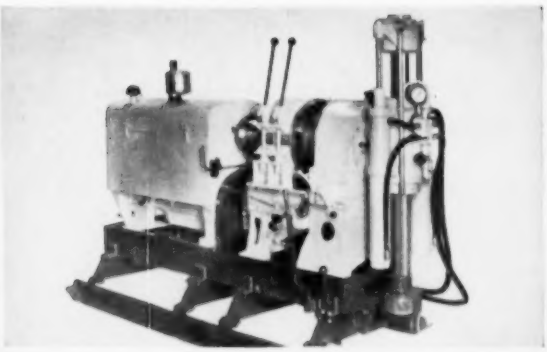

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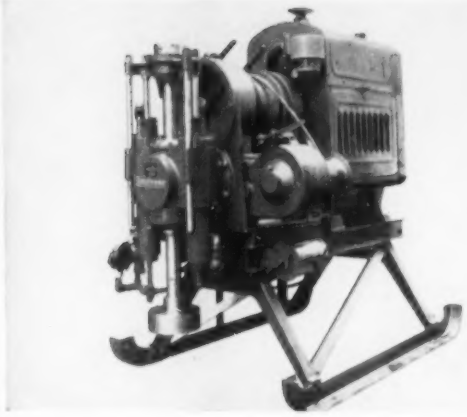

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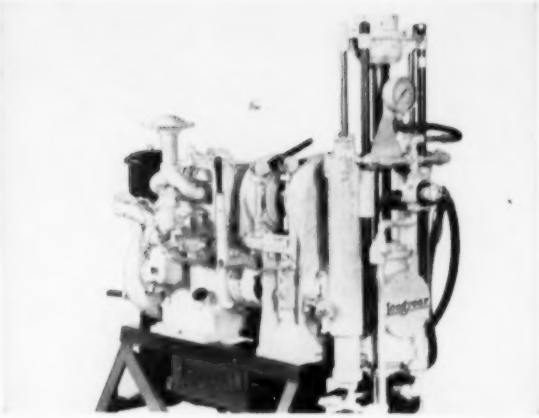

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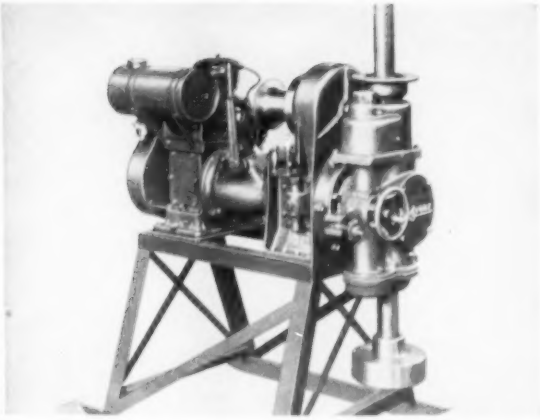

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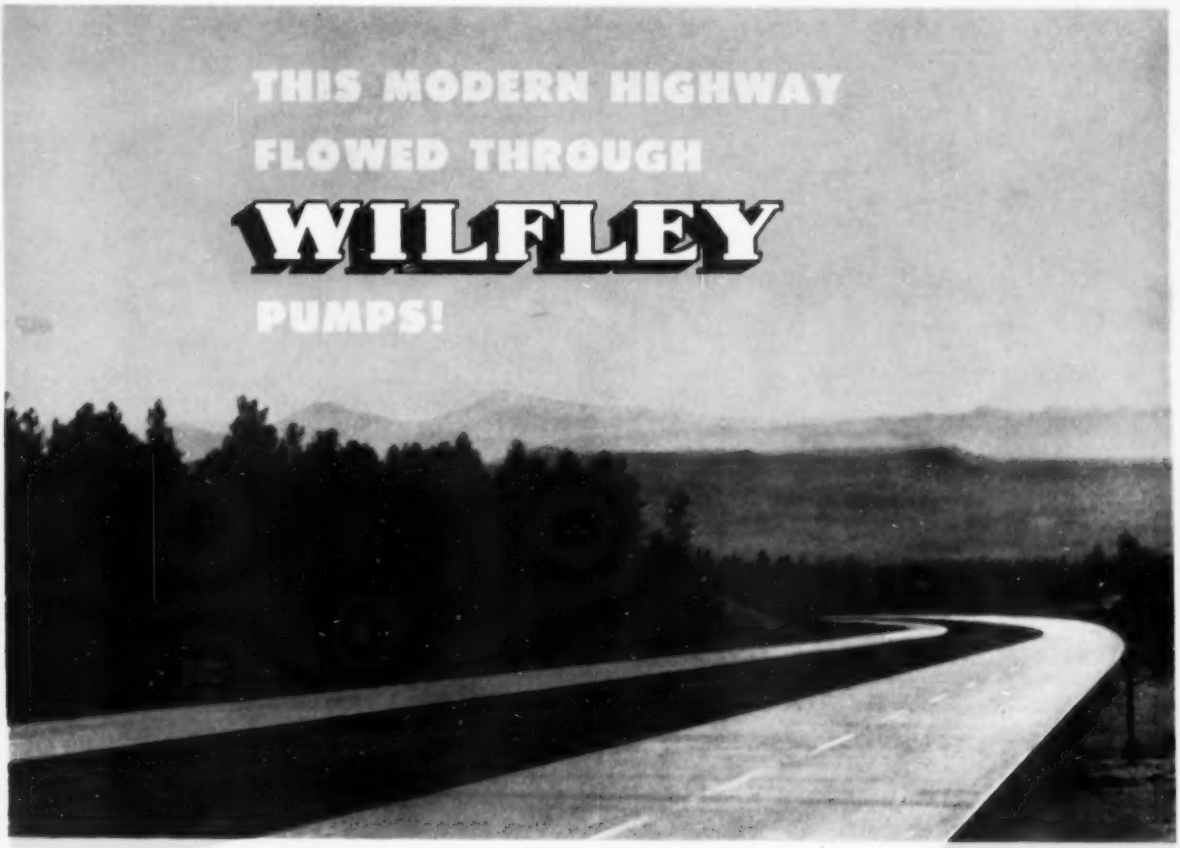

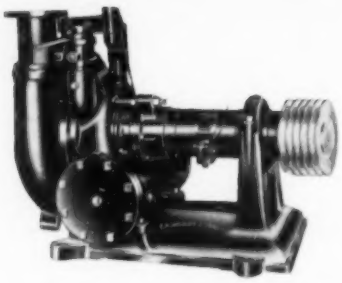

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